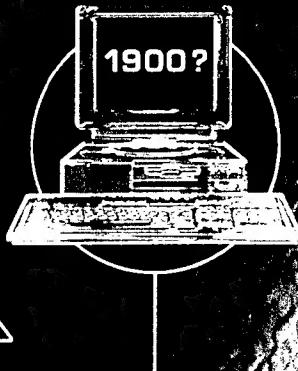


ARMY RD&A



JANUARY - FEBRUARY 1999

Y2K



THE YEAR 2000 CHALLENGE

WHAT LIES AHEAD?

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FROM THE ARMY ACQUISITION EXECUTIVE

Building The 21st Century Army



In the 20th century, scientific discovery and technological innovation have advanced America's military capabilities to the point where we are now the world's mightiest nation. We have before us an unprecedented opportunity to modernize our forces for the 21st century without worrying about a strategic rival that could threaten our existence. Our concerns look to the future. Who will be our future adversaries? What technologies will they employ? How do we maintain our technological edge in the 21st century?

Technological superiority is an important component of military advantage. Military advantage goes to the nation best able to capture commercial technologies and incorporate them into weapon systems with new or improved operational capabilities. In large measure, the future readiness and effectiveness of America's Army will be determined by our investments in a relevant technology base.

How do we determine whether the Army is investing in the right technologies to ensure military advantage in the 21st century, particularly for the Army After Next (AAN) in the year 2025 and beyond? And, how do we work with our industry partners to leverage their technological advances for military use? These are not easy questions, but they must be answered. The real challenge is to identify which technologies the Army must develop and which we can expect to buy from the commercial marketplace.

One way we are making sure our nation's technology and industrial bases are focused on the right technologies for the future Army is through the series of Technology Seminar Games (TSGs) we are conducting in cooperation with the Army's Training and Doctrine Command (TRADOC) and the Army Materiel Command. During the last week of July 1998, we held our initial TSG at Carlisle Barracks, PA. Participants included military technologists, scientists, warfighters, threat analysts, and industry representatives from across the nation. This was the first time that the Army teamed with industry to address technological solutions to future military needs. On the final day, participants presented an assessment of various technologies important to our future Army to a Senior Review Group headed by Dr. William Perry, the former Secretary of Defense.

The July TSG was our first broad-based look at the Army Science and Technology (S&T) Program as it relates to AAN. What insights did we gain? We learned that we need a "system of systems" approach, a fully integrated approach to developing weapon systems for AAN. We learned that awareness of the battlespace is key to success, but also that our warfighters cannot be overloaded with unnecessary data. We reaffirmed the importance of an aggressive Army technology base. And, we learned

that we need to do a better job leveraging commercial technology and influencing it where possible.

The system of systems approach is critically important to our future force. For example, the knowledge provided by the Command, Control, Communications, Computers, Intelligence, Surveillance, and Reconnaissance (C4ISR) system will be valuable only if the maneuver and long-range precision strike systems have the speed required to exploit it. Further, the maneuver and precision strike systems will depend on C4ISR to achieve lethality and enhance survivability. Speed, in turn, is a function of the logistic systems that support our ability to move rapidly. None of this will work unless strategic and operational deployment systems get our combat forces where they're needed. Each part will function optimally only as part of the overall system.

All functional areas (maneuver, fire support, logistics, and intelligence systems) must operate together to provide common, integrated C4ISR and to achieve what is called, "information fusion." Here again, there are challenges. One challenge is to convert the mass of battlespace information into battlespace knowledge that will help our commanders make the right decisions quickly in the 21st century. Another is to design a functional C4ISR architecture that can distribute this information effectively throughout the battlespace without inundating the warfighter with unneeded information.

Our in-house S&T Program must be aggressive and focus on leap-ahead technologies for long-term, AAN force capabilities. Likewise, we must take a more active role in finding out what is happening in the commercial S&T world and determining how we can leverage advances. We must make sure industry leaders know our needs and are interested in meeting them. Successful use of the commercial sector will allow greater flexibility in Army-specific technology development.

Our Technology Seminar Games, along with TRADOC's advanced warfighting experiments, war games, and other Army plans and studies, are helping us to change America's Army into a 21st century force. Our next TSG is scheduled for July 1999. I am looking forward to learning about the new insights that will emerge. We are on a journey. We know that the future battlespace will be much different than any we've encountered before. Our job is to make sure that our future soldiers are prepared—well trained, well led, and well equipped—to fight, win, and come back alive.

Paul J. Hoeper

JANUARY-FEBRUARY 1999

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FEATURES

Winning The First War Of The Information Age: Year 2000

Miriam F. Browning 2

Year 2000 Operational Evaluations

LTC William H. Campbell and CPT Shurman L. Vines 7

The U.S. Army Medical Command's Cure For The Millennium Bug

LTC James B. Crowther 13

U.S. Army Corps Of Engineers Braces For Y2K Challenge

Kenneth E. Buck 15

CECOM Y2K Weapon Systems Management Program

Myron S. Samuel and SFC Roxie Blackmon 18

Army Materiel Command Year 2000 Quality Assurance Policy And Implementation Guidelines

Edgar F. Brasseur 20

Overarching Partnering Agreements

Mark A. Sagan 21

Reducing O&S Costs Through Design Influence And Modeling And Simulation

LTC Donald P. Kotchman, James R. Carraallah, and Wesley L. Glasgow 23

21st Century Mobile Weapon Platform

Terrence Eugene Shirley 27

Defining The Operational Concepts For The Crusader System

Dr. Linda G. Pierce, Walter W. Millspaugh, and William A. Ross 29

Family Night At PM-NV/RSTA

Suzanne Schmitz 33

Modernization Through Spares Implementation Process

Terry L. Mullins and Barry K. Pepper 35

Teaming Airborne Manned And Unmanned Systems

MAJ Allen L. Peterson and Kristopher F. Kuck 39

U.S. Army Aberdeen Test Center Accelerated Corrosion Test Facility

Steven King 41

Developing Effective Teams

Steve Hammonds 43

Reviewing The Army's Mine, Countermine, Nonlethal Weapons, and Demining Programs

Brian M. Green and John M. Gallagher 46

The Value Of Outsourcing

J. Michael Brower 48

Contingency Contracting In Korea: A Civilian's Perspective

William Mills 50

DEPARTMENTS

Speaking Out 52

Career Development Update 54

Acquisition Reform 56

Conferences 56

Books 57

News Briefs 58

Personnel 59

Letters 59

COVER

During the past year, the Department of the Army has done a great deal of work to ensure that its programs, systems, and installations are year 2000 compliant and ready to meet the challenges of the 21st century.

WINNING THE FIRST WAR OF THE INFORMATION AGE: YEAR 2000

Introduction

The first war of the Information Age, the year 2000 (Y2K), has proved to be daunting and complex. There is probably no Army program, tactical unit, or installation that has not experienced the impact of Y2K. Telecommunications networks in Bosnia, personal computers in the Pentagon, and weapon systems in the 4th Infantry Division are only a few examples of the hundreds of thousands of information systems and information technology (IT)-controlled devices in the Army that have been assessed and are being fixed to be Y2K compliant. A complete picture of Army computer-based systems is shown in Figure 1.

Like most of the world, which is highly

Miriam F. Browning

Regulations language in contracts, and ensuring that test agreements are in place for Army customers at the Defense Information Systems Agency data processing megacenters.

Management resolve and persistence will win the Y2K war. In addition, there are three "magic bullets" that can be used to make sure that the Army will be Y2K ready at the dawn of the 21st century. They are as follows:

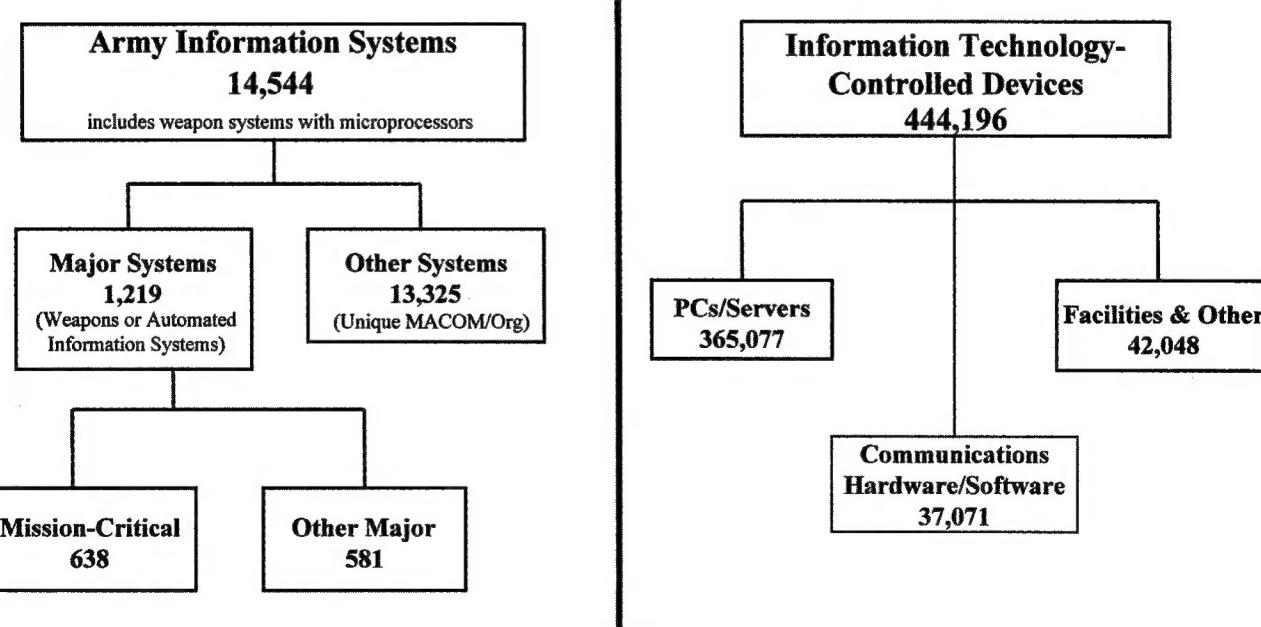
- Well planned and realistic tests;
- Searches to find and fix embedded processors; and
- Credible contingency plans.

To best use these magic bullets, an understanding of the Army's current Y2K situation is important.

dependent on computer and communication systems, the Army has less than 1 year left to complete the process to implement Y2K fixes on all its systems and devices. During the past year, Army organizations worked diligently to identify Y2K problems and renovate their software code. The Army has met major Department of Defense (DOD) Y2K policy mandates. These include completing systems interface agreements, incorporating the appropriate Y2K Federal Acquisition

Army Computer-Based Systems

As of Oct. 15, 1998



458,740 total information systems and information technology (IT)-controlled devices
Unknown number (probably millions) of embedded chips with IT in weapon systems

Figure 1.

Army Mission-Critical Systems Status

As of Oct. 15, 1998

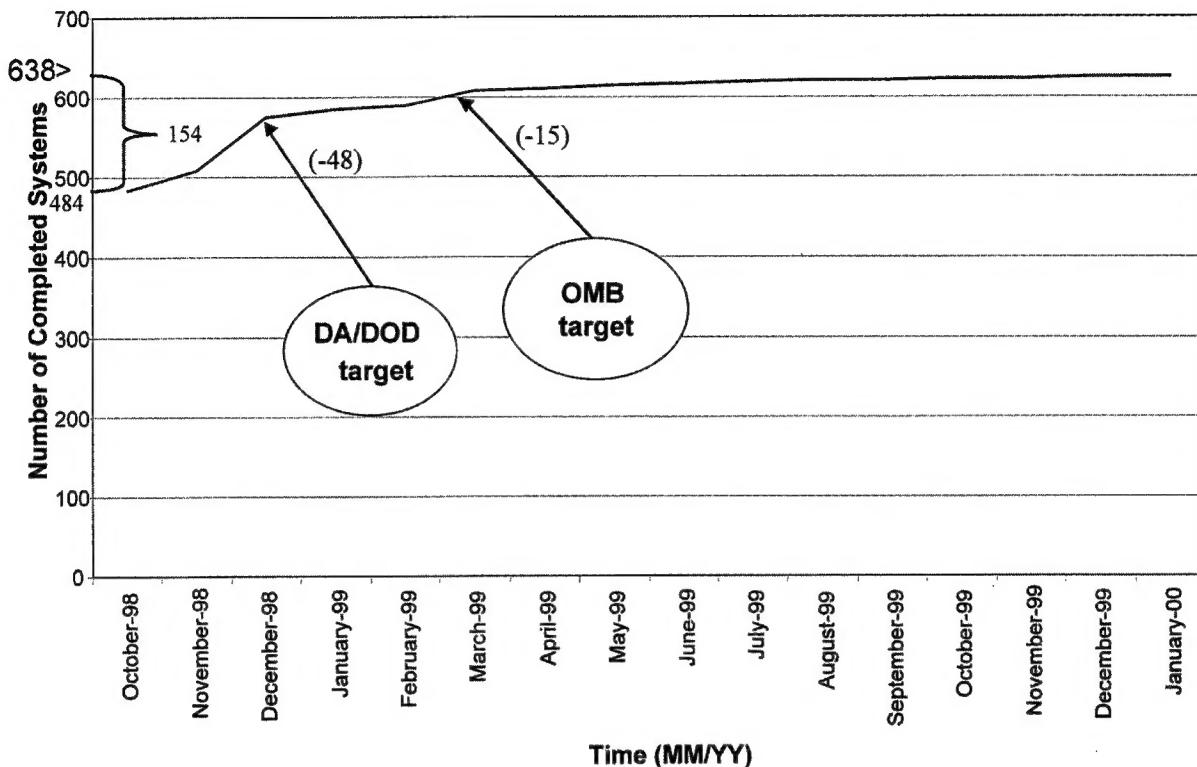


Figure 2.

Current Situation

In October 1998, 76 percent of Army mission-critical systems were already Y2K compliant. By March 1999 (the completion date set by the Office of Management and Budget (OMB)), 98 percent of Army mission-critical systems will be Y2K compliant. Figure 2 shows the Army's mission-critical systems status.

The Army has 638 mission-critical systems. These include the major weapon systems and automated information systems that directly affect the Army's go-to-war mission and are necessary for commander-in-chief (CINC) deployments and exercises. Examples of mission-critical weapon systems include the Patriot Missile System, the Apache Attack Helicopter, the Single Channel Ground and Airborne Radio System, and the Bradley Fighting Vehicle. Examples of mission-critical automated information systems include the Army Total Asset Visibility System, the Standard Depot System, the Reserve Component Automation System, and the Global Command and Control System Army.

More than 94 percent of Army weapon systems are Y2K compliant, mainly because many of them do not process dates and do not interface with any digital system. Army automated information systems are more difficult to fix because they have old legacy code that must be rewritten and interface with other systems that must be integrated.

The Army has more than 13,900 non-mission-critical systems. A small subset, 581 systems, includes other major weapon systems and automated information systems that are mission essential but not mission critical to the Army. Generally, modeling and simulation systems, budget systems, and manpower accounting systems fall into this category. The remaining nonmission-critical systems are primarily major command (MACOM) and installation-unique systems.

Lastly, the Army has approximately 153,000 IT-controlled devices that need Y2K fixes. These are personal computers and servers; telecommunication switches and routers; and installation infrastruc-

ture devices such as heating and air conditioning systems, building security systems, hazardous material monitoring systems, air traffic control systems, and utility systems.

Despite the magnitude and hard work involved in fixing Y2K for the Army, there is a bright side. Because of Y2K, the Army plans to eliminate or replace 3,211 systems, mainly at the MACOM and installation level. A substantial number of personal computers and servers will be upgraded, thus providing our soldiers and civilians with more productive tools to get their jobs done. Army telecommunication switches at posts, camps, and stations will be modernized. This will provide a common, interoperable network on which to host IT infrastructure improvements such as intranets, high-speed data networks, and video. Lastly, life on Army installations will improve with the addition of new security systems, heating and air conditioning systems, and upgraded physical plants. The scope and cost of fixing the Army's current Y2K problem are shown in Figure 3.

Well Planned And Realistic Tests

After each Army system has undergone Y2K testing, there is a high probability, especially if it is a mission-critical system, that it will undergo overall DOD-wide tests. These tests include joint operational evaluations with the CINCs and functional end-to-end tests with the Office of the Secretary of Defense (OSD) Principal Staff Assistants, specifically in the areas of communications, finance, logistics, personnel, health and medical, and intelligence.

The Army's concept for conducting operational evaluations is to develop joint task force scenarios in conjunction with typical combat and combat-support exercises simulated in a Y2K timeframe. The CINC-led command post exercises will be scripted with "time ordered events lists" to test critical interfaces and date-related processes among mission-critical and go-to-war systems. The Office of the Director of Information Systems for Command, Control, Communications and Computers (ODISC4) has the lead for these operational evaluations, partnering with the Office of the Deputy Chief of Staff for Operations and Plans, which has the lead for operational evaluation planning. The U.S. Army Operational Test and Evaluation Command will provide instrumentation and evaluate data collected on Y2K. To

minimize disruption to training and readiness, tests will be conducted in real and simulated environments and will take advantage of planned CINC exercises.

The Army's mission in conducting these tests is to demonstrate the ability to accomplish critical missions and ensure readiness in a Y2K environment. The Army's goal is to ensure that the warfighter's mission-critical and go-to-war systems will not fail when the millennium rolls over. To achieve this goal, the Army will conduct end-to-end tests of "mission threads." These threads include land combat; fire support; aviation; command, control, communications and computers (C4); combat service support; intelligence; maneuver; and air defense.

In the C4 area, the Army will focus on end-to-end tests of the data transport structure. This structure includes major DOD systems such as the Defense Information Systems Network, the Joint Warfighting Information Communications System, the Defense Red Switch Network, the Defense Switch Network, the Non-classified Internet Protocol Router Network, and the Secret Internet Protocol Router Network. Information exchanges will be tested on voice, data, imagery, and video.

The Army has completed or will schedule a number of other Y2K tests to demonstrate its ability to ensure warfighting capabilities are Y2K ready. Two pri-

mary Army Y2K test sites are Fort Bragg, NC, and White Sands Missile Range, NM. At Fort Bragg, a partnership consisting of ODISC4, the U.S. Army Communications-Electronics Command, the Forces Command, and contractors performed an initial test in September 1998 on the XVIII Airborne Corps' Joint Task Force C4 infrastructure. Various communications end-to-end links were tested. Initial results showed that there was no loss of voice or data transfer services during the Y2K rollover times. However, in some cases, the dates the systems displayed or printed were incorrect. Several minor date-related problems were identified after the Y2K-compliant software was loaded, but there was no degradation in the overall communications services. Additional tests at Fort Bragg will continue to evaluate communications devices in other deployment scenarios.

White Sands Missile Range has conducted and will continue to conduct Y2K tests of its major functions, operations, and infrastructure. This year-long effort is being done in partnership with the U.S. Army Test and Evaluation Command and numerous other government and contractor experts. The first test, conducted in July 1998, evaluated the optics, radar, telemetry, and associated computers supporting a test flight of a computer-controlled Phantom F-4. Rollover dates were execut-

Scope and Cost of Army Y2K Problem

As of Oct. 15, 1998

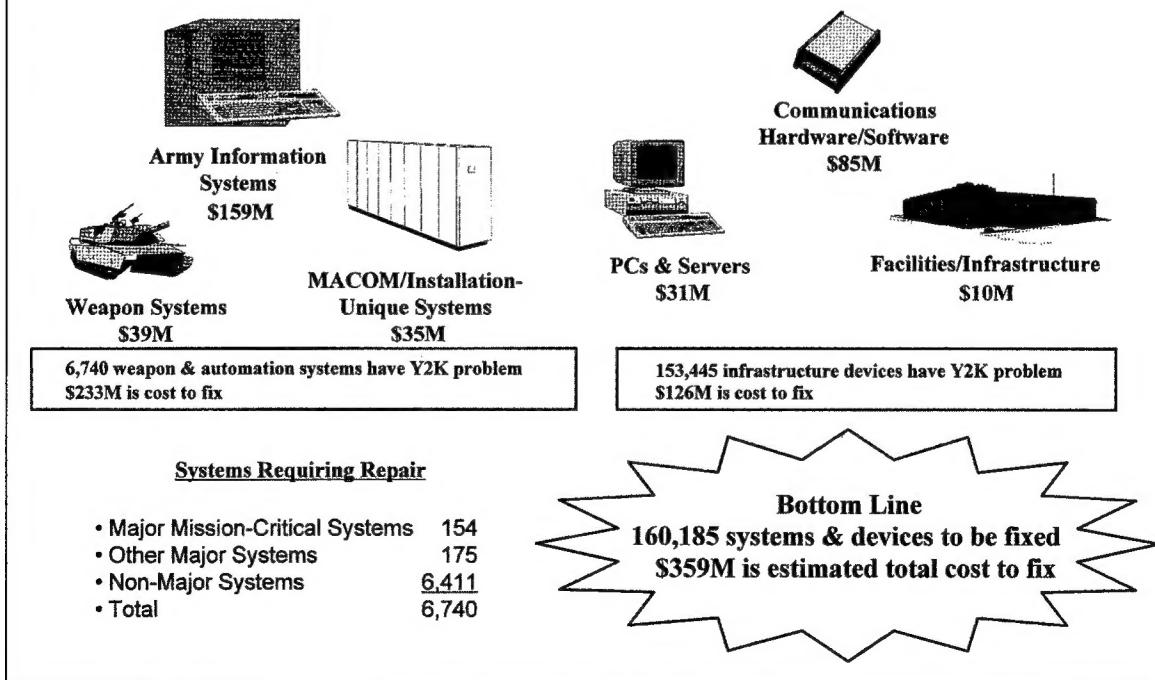


Figure 3.

ed during the course of a test lasting several hours. Test results indicated that there were no Y2K-related computer or instrument failures, errors, or abnormalities.

White Sands Missile Range also conducted two additional Y2K tests. The first was a test of its infrastructure last October, testing telephone switches and all communications and computing infrastructure not tested with the Phantom F-4. (See Page 58 of this magazine.) The second was a test of its operational elements. Specifically, live-fire tests of various weapon systems such as the Advanced Field Artillery Tactical Data System, the Apache Longbow, the Kiowa Warrior, and the Multiple Launch Rocket System were performed using date-forwarding routines. Throughout all White Sands Missile Range tests, tenant organizations, private sector firms, and the local communities have and been and will continue to be involved. White Sands continues to demonstrate Y2K leadership for the Army.

Finding And Fixing Embedded Processors

There are more than 25 billion embedded processors or computer chips worldwide, controlling everything from airplanes, biomedical devices, cars, appliances, and power plants. An embedded processor is any computer chip that performs a specific function in a system. Most embedded processors are not time or date sensitive. However, embedded processors function with other embedded processors to perform larger tasks. Failure of only one embedded processor can have a devastating ripple effect on a system.

To find and fix embedded processors, seven key steps are required:

- Establish an embedded systems team charged with the task responsibility;
- Conduct a thorough inventory of items that contain embedded processors;
- Assess and analyze each embedded processor as to its compliance status, risk if not fixed, cost and time to fix, and mission criticality;
- Determine which embedded processors to retire, repair, replace, or work around;
- Formulate a remediation plan taking into account cost, schedules, and priorities;
- Remediate embedded processors, doing the mission-critical ones first; and
- Validate the embedded processors by making sure the remediated ones work by themselves and operate in concert with their larger systems.

The best way to determine if a system has embedded processors is to check with the original manufacturer of the system. With a heightened awareness of the Y2K problem, most commercial firms address this concern on their Internet websites.

To ascertain whether a specific system

that contains embedded processors is Y2K compliant is not always an easy endeavor. For example, most vendors will state that their Pentium II computers are Y2K compliant. However, one Army organization that ordered Pentium II personal computers from a standard Army contract found that 10 percent of these brand new computers were not Y2K compliant when simple Y2K tests were conducted. The manufacturer did replace the chips at no cost to the Army; however, the persistence and resolve of the Army organization in testing each machine paid off.

Older or unique systems, e.g., heating and air conditioning systems manufactured by foreign firms and in use on our bases overseas, may present problems. Users of these systems might find that the best course of action would be to replace the system.

The Army's Y2K website has links to many other Y2K websites to include those of the Office of the Assistant Chief of Staff for Installation Management and the General Services Administration, organizations that have done extensive research on embedded processors. Major Y2K websites are listed in Figure 4.

Credible Contingency Plans

Although the Army expects to fix Y2K-related problems by Jan. 1, 2000, there is the possibility that some systems may not be ready. This could be connected to testing or fielding delays, late delivery on Y2K-compliant commercial products, or other valid reasons. Contingency plans are required for all Army mission-critical systems that are not now Y2K compliant. The purpose of a contingency plan is to ensure continuity of Army operations on Jan. 1, 2000.

The General Accounting Office (GAO) has provided beneficial advice and information

to federal government agencies on a variety of Y2K issues. In August 1998, GAO published *Year 2000 Computing Crisis: Business Continuity and Contingency Planning* (GAO/AIMD-10.1.19). The document is a valuable resource in developing Y2K contingency plans.

One of the most credible DOD contingency plans is that developed by the Defense Finance and Accounting Service (DFAS). Its credibility is demonstrated by the fact that realistic measures have been taken to ensure that DFAS' primary mission is accomplished at the millennium rollover, that is, military and civilian personnel and contractors will be paid.

To begin its contingency planning, DFAS issued detailed guidance to all elements of its organization and established a Y2K Contingency Planning Steering Group. The group identified and evaluated the critical business processes and systems under DFAS' purview.

DFAS then developed risk assessments for critical systems and critical feeder systems. Groupware sessions were used to develop consolidated risk assessments for core business and core support processes. These risk assessments involved deliberations on priorities, assumptions, minimum operating capabilities, types of threats, and contingency strategies. Foremost in the minds of DFAS executives was the fact that the driving mission is to pay people.

DFAS contingency plan assumptions are neither excessively optimistic nor pessimistic. They are based on the belief that normal operations will experience some disruption attributable to Y2K.

The first assumption is that all DFAS critical systems will be Y2K compliant prior to December 1999. The next assumption is that problems in areas not under DFAS' control are expected, e.g., disruptions to

MAJOR Y2K WEBSITES

- Army Y2K Restricted Home Page: <http://www.army.mil/army-y2k/Home.htm>
- Army Year 2000 Home Page: <http://www.army.mil/army-y2k>
- HQDA, ACSIM: <http://www.hqda.army.mil/acsimweb/ops/y2k.htm>
- GAO: <http://www.gao.gov/y2kr.htm>
- GSA: <http://www.gsa.gov/gsacio/yr1.htm>
- Mitre Corporation: <http://www.mitre.org/research/y2k/>
- Information Technology Association of America: <http://www.itaa.org/>
- DeJagerY2K Information Center: <http://www.year2000.com/>

Figure 4.

THE ARMY Y2K DATABASE

Information in the Army Y2K database is used for the following:

- Enhance the Army's face to the public. OMB, Congress, GAO, and the media are frequent reviewers of Army Y2K data.
- DOD and Army Y2K accountability. Y2K reports are given weekly to OSD; the Army's Chief Information Officer (CIO) reviews progress on a frequent basis.
- Monitoring Y2K programs. Program Executive Officers (PEOs), Program Managers (PMs), and MACOMs use Y2K data to manage their programs and systems.

The visibility of the Army Y2K database requires that all Army reporting organizations constantly monitor and sample the quality of their data. The Army's CIO is partnering with all PEOs, PMs, MACOMs, and HQDA functional proponents to ensure the Army Y2K database contains the latest, top quality information. Check out your Y2K data. For assistance, contact the Army Y2K Office at (703) 275-9483/6084 or DSN 235-9483/6084.

Figure 5.

the national infrastructures in telecommunications, electricity, and banking. Specifically, this could mean that power problems might occur. Rolling brownouts with some area blackouts for extended periods of time may be the norm. U.S. financial institutions may experience some problems in the first 3 months of 2000, but they will remain operationally solvent because of efforts currently underway by Wall Street, the Federal Reserve Bank, and the World Bank. There will be problems with telecommunications; however, these will be minimized by implementing preventive measures such as those recommended by GAO and Wall Street for temporarily curtailing operations beginning Dec. 30, 1999.

DFAS identified the minimum essential operations required to avoid mission failure. To minimize disruption to mission-critical operations, DFAS developed a number of "zero day" strategies. These include the shutdown of all computer operations on Dec. 30, 1999, with a restart scheduled for Jan. 1, 2000, and the acceleration of paydays and the subsequent notification of customers through leave and earning slips. Also being considered is the development of specific memorandums of agreement with service providers internal and external to DOD, and the activation of crisis management teams.

DFAS also developed a number of proposals to reduce workload during the critical period November 1999 to February 2000. Some of these proposals involve policy and legal changes. For example, DOD can probably issue moratoriums on discretionary travel and permanent

change of station as well as on discretionary personnel actions such as promotions, awards, and new hires. The military Services and DOD agencies will be advised to stockpile mission-essential items; encourage minimal personnel actions, e.g., address changes, allotments, retirements, leave, training, and travel; and maintain current home or mailing addresses in the pay/personnel systems.

However, there are a whole series of policy and/or legal change proposals that may involve congressional or OMB approval. These include changing the dates for open seasons for health benefits plans, the Thrift Savings Plan, and the Combined Federal Campaign; changing the program objective memorandum/budget cycles; relaxing cash management policies; changing contract terms; and reducing contractor billings in December 1999. Proposals for congressional approval include special tax provisions for accelerated payments, increased limits on purchase cards for emergency purposes, relaxing the Internal Revenue Service deadline requirements for W-2 forms, and easing requirements for foreign military sales approvals.

Lastly, DFAS is evaluating strategies for a worst-case scenario: being unable to process payments. Strategies being evaluated include pre-positioning of payroll tapes, printing paper checks, disbursing emergency cash payments (mainly for overseas locations), paying Reservists based on previous month drill performance, maximizing the use of credit cards, and delaying contract awards.

The DFAS contingency planning process

is a dynamic one that is constantly being reviewed and improved by the executive leadership of the organization. During 1999, DFAS units will conduct contingency plan training and perform specific tests and exercises to see which ones work and which do not. The bottom line is that DFAS is an organization that has demonstrated dedicated and persistent top quality management in ensuring that its primary missions will not fail when the millennium rolls over.

Conclusion

There are a number of other areas that require continued leadership and attention as the Army completes preparation for Y2K. First, all Army reporting organizations must ensure that their portion of the Army's Y2K database is timely, accurate, thorough, and logical. A synopsis of the importance of the Army's Y2K database is shown in Figure 5. Next, all system owners must ensure that their systems are correctly certified and documented when they become Y2K compliant. This is an essential final management control on the Y2K process and ensures that due diligence with regard to Y2K has been followed by the Army. In addition, all contracting officers should continue to scrutinize contracts, task or delivery orders, blanket purchase agreements, or other contractual instruments to ensure Y2K contractual language is present. Lastly, all Army soldiers, civilians, and contractors should continue to use and contribute to the Army's Y2K lessons learned on the Army Y2K website so the entire community can benefit from their insights.

Y2K is one of the toughest wars in today's information technology environment. The above-mentioned considerations plus the three magic bullets—well planned and realistic tests, finding and fixing embedded processors, and credible contingency plans—can go a long way toward ensuring that the Army is Y2K ready for the 21st century.

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YEAR 2000 OPERATIONAL EVALUATIONS

LTG William H. Campbell
and CPT Shurman L. Vines

Introduction

The year 2000 (Y2K) problem is one of the most pressing challenges facing the Department of Defense (DOD) today. It is my [LTG Campbell] top priority. As the world scrambles to deal with the problem and avoid a crisis at the dawn of the new millennium, the Army is committed to ensuring its systems remain operational. Our task is to find and remediate all Y2K problems that would affect missions across the full spectrum of operations, to include weapon systems, the sustaining base, and facilities. At the time this article was written, the world had 1 year, 1 month, 10 days, 4 hours, and 14 minutes to deal with this potential crisis, and the clock is ticking.

As everyone involved in Y2K remediation knows, the target date for implementing Y2K fixes was Dec. 31, 1998. This allowed a full year to resolve unforeseen problems between the fix date and the new millennium. Systems

that were not corrected by the suspense date were categorized as "high risk" and managed accordingly. Although some systems remain to be fixed and fully fielded during 1999, most of our 1999 Y2K activity will be devoted to end-to-end testing as described below. Systems will be evaluated in one or more of the following categories of end-to-end test events, details of which were still in development as of this writing in late 1998:

- Commander-in-chief (CINC)-led Y2K end-to-end operational evaluations of critical mission threads as directed by the Secretary of Defense. Selected Army systems and organizations will be involved.
- Functional Y2K end-to-end evaluations in the personnel, logistics, health and medical, communications, and intelligence areas as directed by the Deputy Secretary of Defense. Again, selected Army systems and organizations will be involved.

• Army Y2K end-to-end evaluations of critical mission threads that were not evaluated in other tests (e.g., CINC-led tests). This category includes tests scheduled at facilities such as the White Sands Missile Range in New Mexico, and the Central Technical Support Facility (CTSF) at Fort Hood, TX.

Y2K Challenge

One of the most perplexing Y2K challenges is whether we have found all of the problems that could affect weapon systems, because any weapon system that has electronic components could be affected. Any program manager or agency responsible for a system with embedded microprocessors (and that's probably most systems today) has a potential problem.

What needs to be done? The Army must identify the problems, fix systems, test all systems end-to-end in their operational modes, certify systems and information technology (IT)-controlled devices as Y2K compliant, and develop contingency plans to ensure continuity of operations. To accomplish this, we are executing the most comprehensive information technology project in our history.

When the year 2000 dawns, many older computer systems, software programs, communication devices, and weapon systems will malfunction if they are not remediated. This is the result of the nearly universal practice of using two digits rather than four digits to designate the calendar year. This old two-digit date can lead to incorrect results whenever computer software performs arithmetic operations. Another complicating factor is the leap

Our task is to find and remediate all Y2K problems that would affect missions across the full spectrum of operations, to include weapon systems, the sustaining base, and facilities.

Glossary

ABCCC	Airborne Battlefield Command and Control Center
ABN	Airborne
ACP	Assault Command Post
AFATDS	Advanced Field Artillery Tactical Data System
AOE	Army Of Excellence
ARFOR	Army Forces
ASAS	All Source Analysis System
ASLT CP	Assault Command Post
ASOC	Air Support Operations Center
BB	Back Bone
BDE FSO	Brigade Fire Support Officer
BDE TAC	Brigade Tactical Control Party
BN TOC	Battalion Tactical Operations Center
BVT	Battlefield Video Teleconferencing
CAV	Command Assault Vehicle
CISCO	Computer Information Systems Co.
COMSEC	Communications Security
CORPS TOC GSM	Corps Tactical Operations Center Ground Station Module
CSSCS	Combat Service Support Control System
CSU/DSU	Channel Servicing Unit/Data Service Unit
DES	Dismounted Entry Switch
DISN	Defense Information Systems Network
DLOS	Dismounted Line Of Sight
DRB	Defense Ready Brigade
E-FES	Enhanced-Force Entry Switch
FA BN	Field Artillery Battalion
FBCB2	Force XXI Battle Command For Brigade and Below
FDC	Fire Direction Center
FDS	Fire Direction System
FIST	Fire In Support Team
FM	Frequency Modulation
GCCS	Global Command and Control System
GMF	Ground Mobile Force
HF	High Frequency
IDNX	Integrated Data Network Exchange
IFSAS	Interim Fire Support Automation System
IMETS	Integrated Meteorological Station
JIC	Joint Intelligence Center
JSIPS	Joint Service Imagery Processing System
JSTARS	Joint Surveillance and Target Attack Radar System
JTF	Joint Task Force
JTFX	Joint Task Force Exercise
JTIDS	Joint Tactical Information Distribution System
kbps	kilobits per second
MCS	Maneuver Control System
MFCS	Mortar Fire Control System
MLRS	Multiple Launch Rocket System
MSE	Mobile Subscriber Equipment
RETRANS	Retransmission Station
RJ	Rivet Joint
SAT	Satellite
SC	Single Channel
SEN	Small Extension Node
SINCGARS	Single Channel Ground and Airborne Radio System
SIPRNET	Secret Internet Protocol Router Network
SOF	Special Operations Forces
TAB	Target Acquisition Batter
TACFIRE	Tactical Fire Control System
TACP	Tactical Air Control Party
TACSAT	Tactical Satellite
TADIL	Tactical Data Information Link
TADIXS	Tactical Data Information Exchange System
TCC	Troop Carrier Command
TPN	Tactical Packet Network
TTC	Tactical Telephone Center
UHF	Ultra High Frequency

year calculation. Year 2000 is a leap year. In the Gregorian calendar, leap years are determined using the following three rules:

- Years divisible by 4 are leap years, unless ...
- Years also divisible by 100 are not leap years, except ...
- Years divisible by 400 are leap years.

Therefore, according to the third rule, the year 2000 is a leap year. However, many programmers were unaware of the rules, so some software will interpret year 2000 as having only 365 days instead of 366, which will cause many date-dependent and forward-referencing systems to fail. A complicating factor for weapon systems is that many devices, components, and subsystems have embedded microprocessors that are subject to the same Y2K problems.

A major concern is embedded processors. People have said, "My system processes real-time data measured in nanoseconds, not decades or centuries, so Y2K is not a problem for me." That's the wrong answer. The real-time system may not function after Dec. 31, 1999, if it has "black boxes" that have non-Y2K-compliant embedded processors. These microprocessors are in subtle places like controllers, uninterrupted power supplies, and preflight equipment. The first step in handling concerns with embedded processors is to determine where the processors are and whether they are date driven. Fixes or workarounds are not necessarily difficult after the processors have been found; but finding them may be a real challenge, especially in black boxes built to a performance specification. The Army has nearly 459,000 information systems and IT-controlled devices, but there may be millions of embedded chips in other systems.

Army Y2K Management Philosophy

The Army's approach to fixing the Y2K problem is similar to successful methods used by many other large organizations. Headquarters, Department of the Army (HQDA) issues centralized policy and oversees progress, but system "owners" are responsible for all aspects of remediation. With decentralized execution at the operating unit level, program executive officers (PEOs), program managers (PMs), major commands, and other system owners are responsible for fixing, testing, and ensuring their systems and devices are Y2K compliant. Y2K is everyone's business!

Operational Testing: Three Levels/Domain Focus

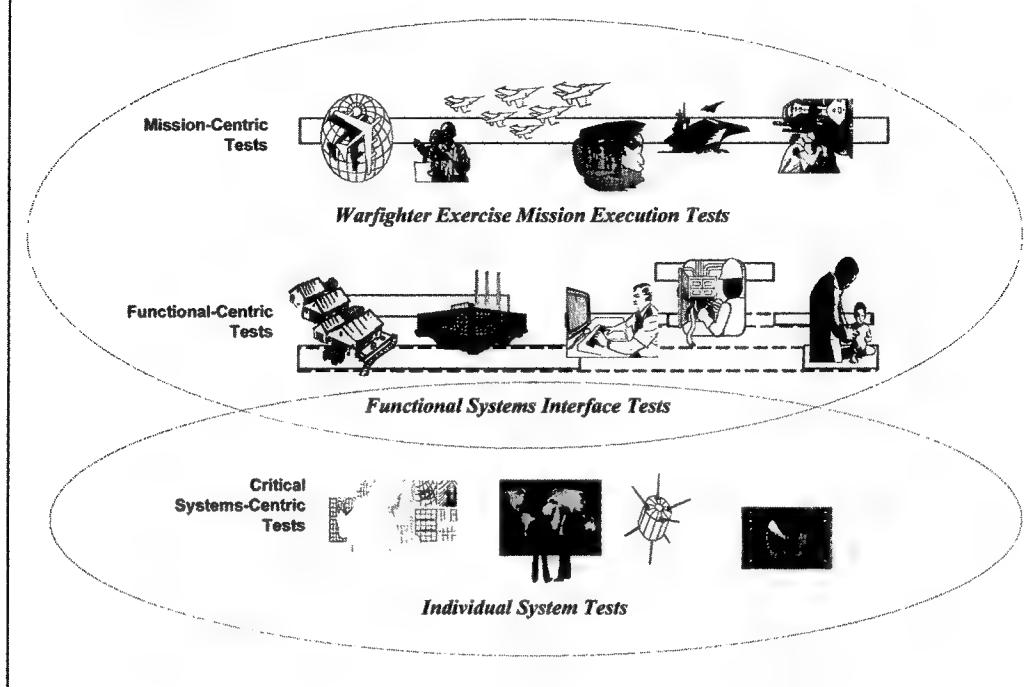


Figure 1.

System Interoperability Coordination, Analysis and Testing Will Make The Problem Difficult To Solve

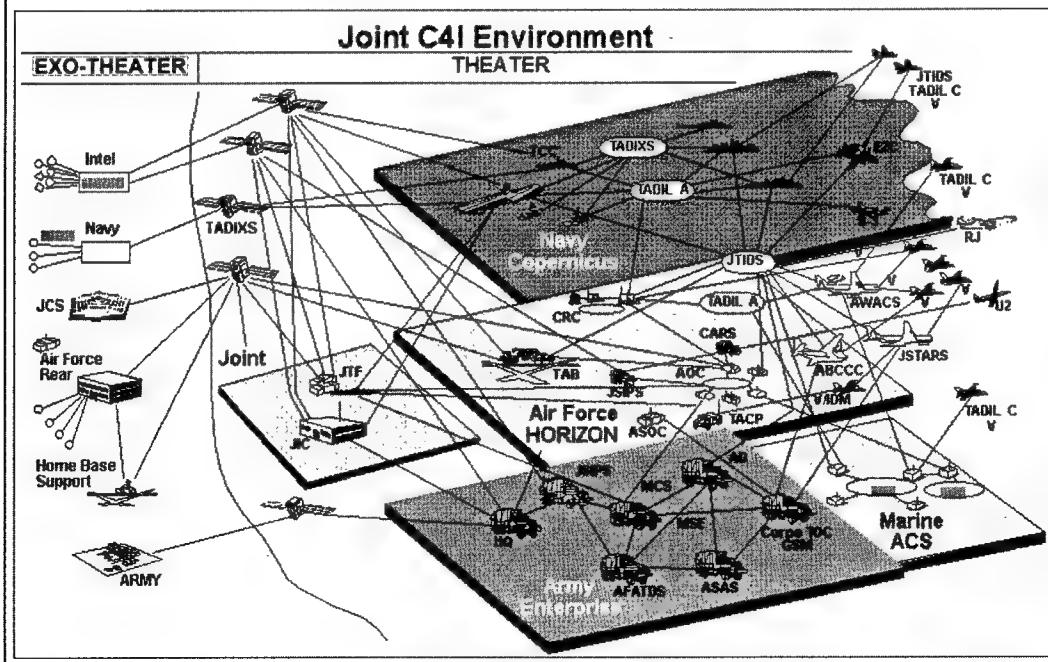


Figure 2.

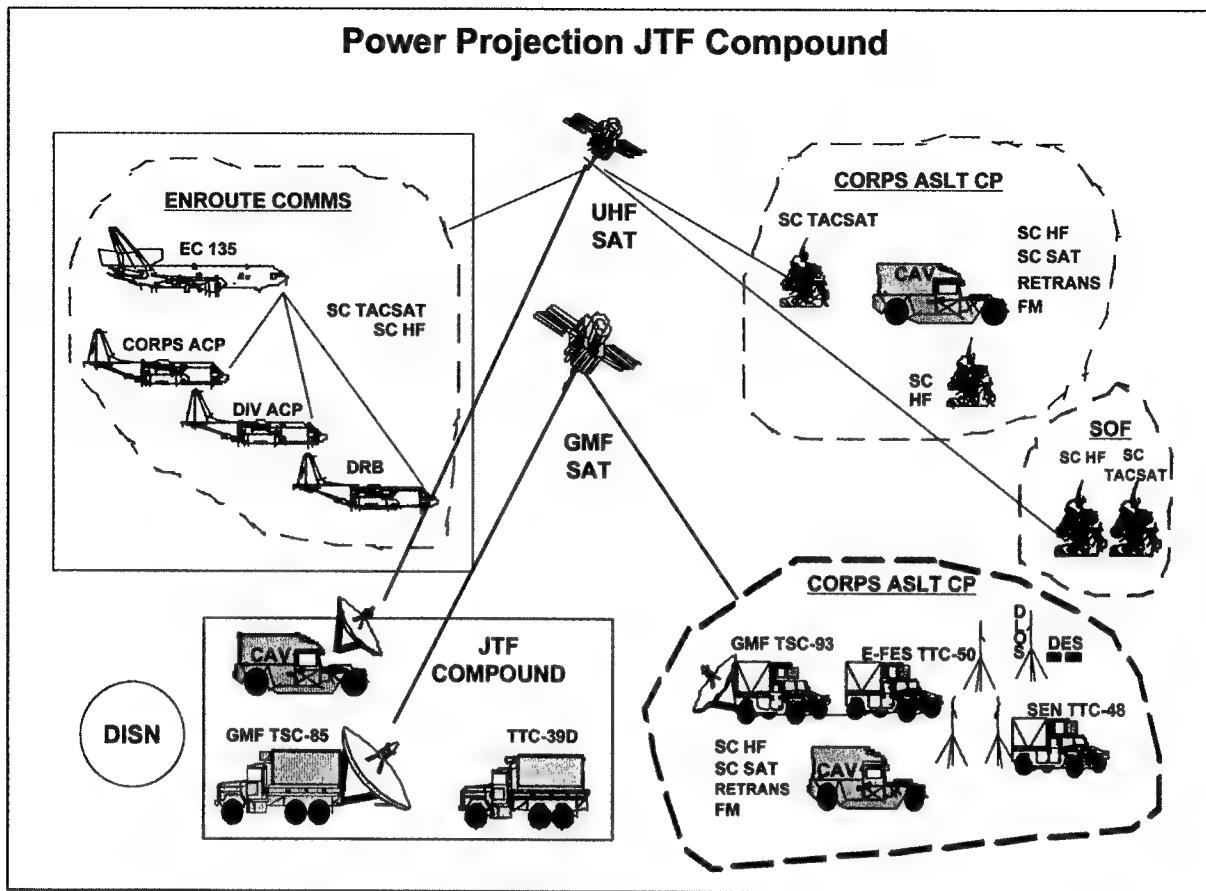


Figure 3.

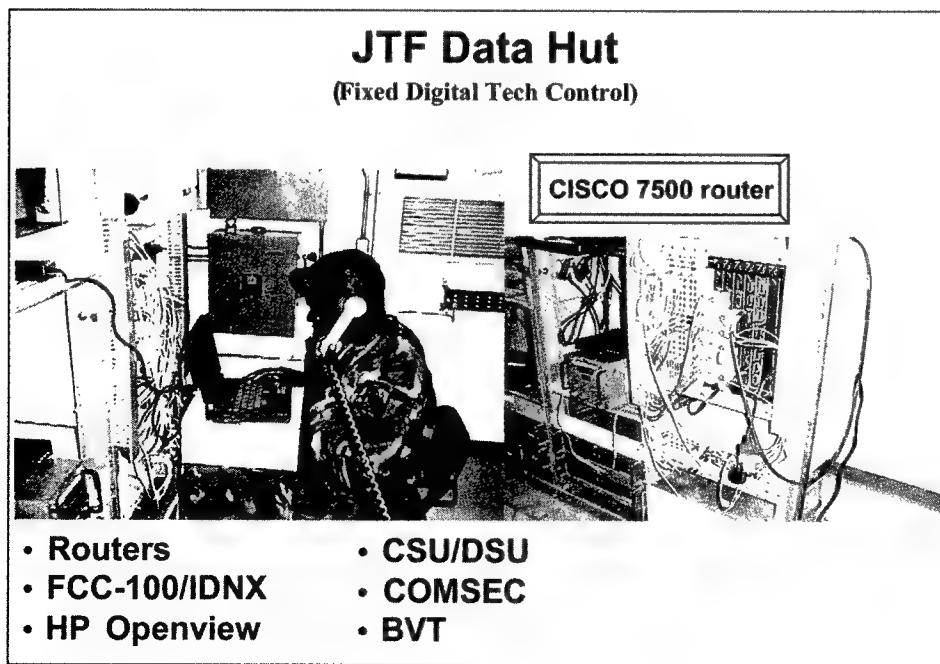


Figure 4.

Operational Guidance

In an Aug. 7, 1998, memorandum, Secretary of Defense William S. Cohen wrote, "I have asked the Chairman of the Joint Chiefs of Staff (JCS) to develop a Joint Y2K Operational Evaluation Program and ... Starting with their next quarterly reports to me, each of the unified commanders-in-chief will review the status of Y2K implementation within his command and the commands of subordinate components."

GEN Joseph W. Ralston, Vice Chairman of the Joint Chiefs of Staff recently stated, "The goal is to view interlocking systems and data flow normally seen during our wartime or peacetime operations in a simulated Y2K environment ... to ensure our readiness and mission accomplishment will not be hampered by Y2K problems ... to assure the warfighters that their key mission critical systems will not fail due to Y2K perturbations, as isolated systems or as part of the interconnected systems environment in which

JTFX-98 Special Circuits

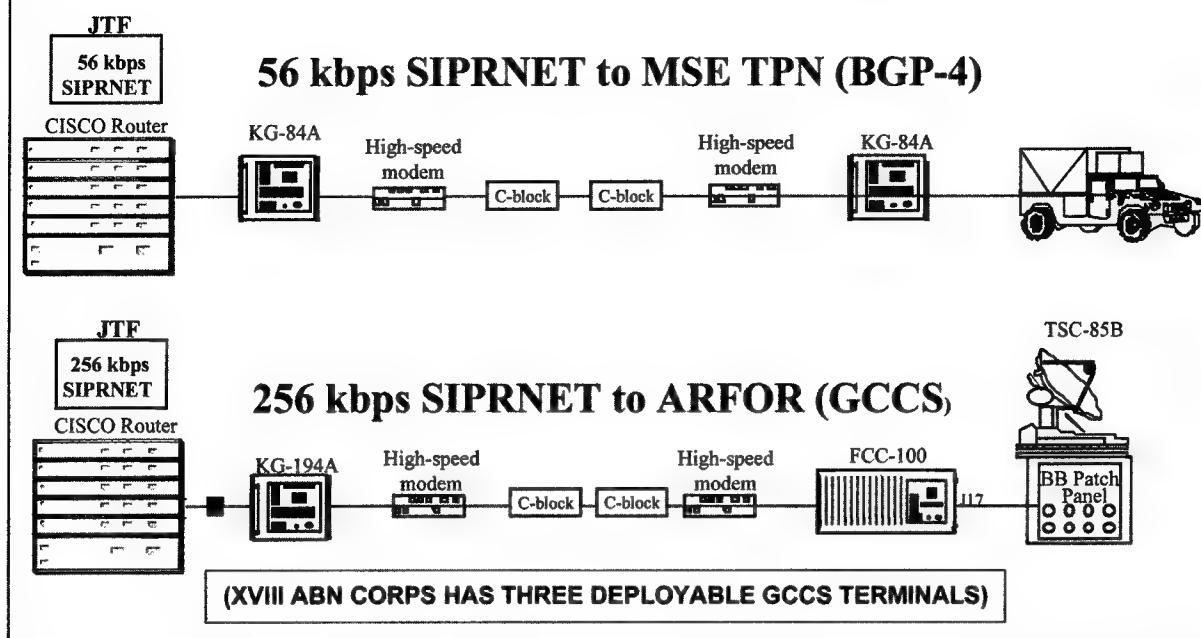


Figure 5.

warfighting and peacekeeping missions are conducted."

Dr. John J. Hamre, Deputy Secretary of Defense, wrote in an Aug. 24, 1998, memorandum, "Each Principal Staff Assistant (PSA) of the Office of the Secretary of Defense (OSD) must verify that all functions under his or her purview will continue unaffected by Y2K issues. Plans for Y2K-related end-to-end testing of each process within the following areas must be provided to me by the designated OSD PSA ...: Logistics, Personnel, Health/Medical, Communications and Intelligence."

HQDA Position

The HQDA position is that end-to-end testing of mission-critical systems is essential to ensure continued operations during the year 2000 transition. Figure 1 shows the three levels of required testing, and Figure 2 shows the complexity of this undertaking. Individual systems are now being tested by DOD components (military Services and Defense agencies). After these tests are done, system interfaces must be tested among systems in their actual operational environment or in an appropriate laboratory or at a test range.

The primary purpose of functional testing is to provide a functional risk assessment of mission-critical systems in the Y2K environment. This will be accomplished by verifying that mission-

critical systems will continue to function, verifying that interfaces (including joint ones) between individual and networked systems allow continuous operations, and verifying the effectiveness of contingency plans.

System Certification

Individual system owners certify systems by following the Certification Checklist in the DOD Y2K Action Plan. Those systems identified as mission-critical require certification at the General Officer or Senior Executive Service level and must include interface agreements. Based on input from system owners, HQDA reported to OSD those mission-critical systems that are yet to be validated as Y2K compliant along with timelines for expected validation of these systems. It is critical that system owners manage compliance closely and meet the projected certification dates.

Functional End-To-End Assessments

The functional end-to-end assessments in the logistics, personnel, intelligence, communications, and health and medical areas will focus on verifying critical mission threads for both the Active and Reserve forces. The events and facilities supporting these assessments should provide a controlled, repeatable environment to

facilitate the discovery and fix of unknown Y2K problems. Although final plans are not yet available, we expect that these tests will be conducted using tailored scenarios and notional databases to avoid corrupting live data.

CINC-Led Evaluations

The Army will support CINCs in Y2K operational evaluations in accordance with OSD and JCS guidance. Although the plans are not yet complete, we anticipate testing the interfaces of weapon systems; command, control and communications (C3) systems; and intelligence systems. The participating Army units will be the components of the unified commands. We anticipate testing the components' go-to-war architecture. For example, Figures 3 through 5 show the tactical C3 systems and interfaces we would test at the XVIII Airborne Corps, to include the Power Projection Joint Task Force (JTF) Compound, its data hut, and special circuits. These are excellent examples of the equipment that needs to be tested in the operational end-to-end assessments.

Army-Led Evaluations

The concept for Army-led evaluations is to conduct end-to-end tests of interfaces not tested in other evaluations (e.g., the CINC-led Y2K exercises). We will use a scripted "Time

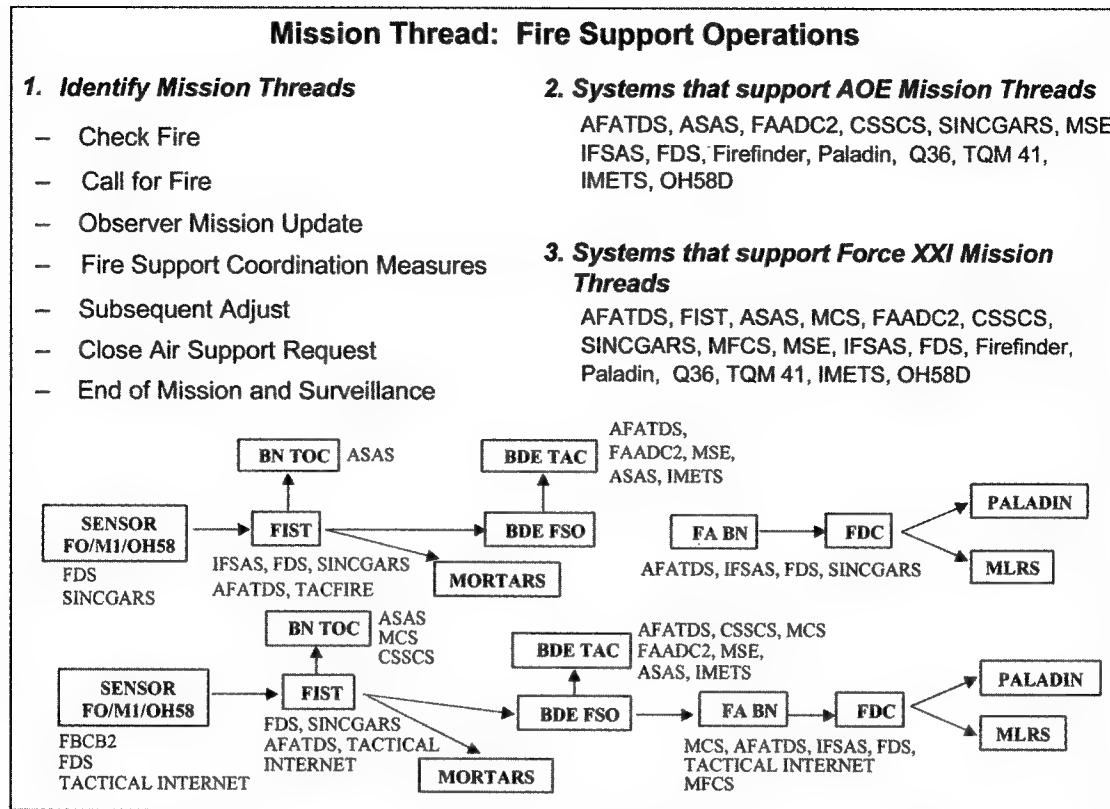


Figure 6.

Ordered Events List" to test critical interfaces and date-related processes. We anticipate leveraging opportunities like revalidating missiles in periodic test shots of in-stock missiles, and comprehensive C3 Y2K tests with soldiers in the CTSF at Fort Hood, TX, in June 1999. This will reduce costs and the impact on personnel tempo. Tactical interfaces or mission threads will be tested end-to-end, (e.g., FIREFINDER Radar to Advanced Field Artillery Tactical Data System (AFATDS) to Battery Computer System (BCS); Airborne Warning and Control Station (AWACS) to Forward Area Air Defense, Command, and Control Intelligence System (FAADC2) via Joint Tactical Information Distribution System (JTIDS); Joint Surveillance and Target Attack Radar System (JSTARS) to Global System for Mobile Communication (GSM) to All Source Analysis System (ASAS)). These tests will be conducted in laboratories, motor pools, the CTSF, or other facilities where we can set up a test environment of systems like those shown in Figure 6.

Process Management

PEOs and PMs have a crucial role in managing this process. They should personally participate in and approve changes to the Y2K database and use it as a management tool. They must

ensure all critical systems, other major systems, and go-to-war systems in the other category have an accurate record in the database. This will provide visibility to CINCs and components asking about status. They should also ensure all interfaces and mission threads are defined and test plans are in place, and that contingency plans are written for systems in the Army Y2K database.

Conclusion

Our success in meeting the Y2K challenge is critical to the Army's success at the start of the new millennium. The Army's ability to shoot, move, and communicate depends on the effectiveness of its information systems and networks. We know what needs to be done and we know the time constraints. Throughout America's history, our Army has demonstrated the ability to meet any challenge. The Y2K problem will be no different. We have the backing of our senior leadership; we have the expertise; and our people have the will to succeed. The key to success will be the function of how well we exercise "due diligence" in managing the remediation processes.

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THE U.S. ARMY MEDICAL COMMAND'S CURE FOR THE MILLENNIUM BUG

Introduction

Although the U.S. Army Medical Command (MEDCOM) is very familiar with such biological bugs as the flu and the common cold, the millennium bug is unlike any other bug Army medics have had to cure. The millennium bug is also known by other names such as the year 2000 problem, or Y2K for short. And unlike biological bugs, the millennium bug infects computers and other electronic equipment that rely on two digits rather than four digits to represent the year. Like other users of information technology in the federal government and industry, medical system programmers wrote code for software programs for many years using the YYMMDD coding convention to identify the year, month, and day. Unfortunately, when Jan. 1, 2000, arrives and the YYMMDD coding convention is used, computers will translate 000101 to mean Jan. 1, 1900, causing errors and unpredictable results.

Since the 1960s, the military medical community has steadily become more reliant on integrated information technology and automation systems to provide the very best medical care to military personnel and their families. Among the many major automation systems used in MEDCOM are the Composite Health Care System, the Theater Army Medical Management Information System, and the Computer Assisted Processing of Cardiograms. These are used in hospital operations, medical logistics management, and cardiac monitoring.

Computer processors are also used extensively in hospitals and other medical facilities to perform routine tasks such as regulating heating and cooling, or distributing power. Biomedical devices are used for such tasks as monitoring a patient's vital signs and controlling the flow of intravenous fluids. Many of these devices also contain microprocessors that could be infected with the millennium bug, or interface with other automation devices that could be infected, thereby posing a risk to patients.

Directives from the Secretary of Defense, the Secretary of the Army, the Army Chief of Staff, and The Surgeon General of the Army all mandate that the millennium bug not be allowed to pose a risk to any critical Department of Defense (DOD) function. In response to this mandate, MEDCOM is applying systematic procedures to identify systems that could be infected by the millennium bug and then cure the problem.

LTC James B. Crowther

To do this, MEDCOM has established priorities, timelines, and methods to modify and test the information systems it relies on for quality health care. For the well-being of patients, this is a high priority and critical responsibility that MEDCOM takes seriously.

Millennium Bug Checkup

MEDCOM has thousands of automated medical information systems, medical facility systems, and biomedical devices that rely on computer software and hardware that could be infected by the millennium bug. MEDCOM's strategy for dealing with the millennium bug is to perform a medical checkup comprising three functional areas: Army Automated Information Systems, Army Medical Facilities, and Army Biomedical Equipment. The checkup process follows the fundamental DOD precept of centralized planning and decentralized execution. This methodology affords MEDCOM maximum flexibility and the optimum means to implement solutions.

Information Systems

Relative to centralized planning, the management strategy for automated medical information systems is the responsibility of the DOD Health Affairs Tri-Service Infrastructure Management Program Office (TIMPO) located at Fort Sam Houston, TX. According to its May 27, 1998, *Guide for Assessing Military Health System Infrastructure Year 2000 Compliance*, TIMPO follows the standard management strategy of the *Department of Defense Year 2000 Management Plan*. The DOD five-phase methodology uses the Awareness, Assessment, Renovation, Validation, and Implementation Phases to provide an incremental process for the millennium bug checkup and cure of automated information systems. The purpose of the Awareness Phase is to promote Y2K awareness throughout MEDCOM. As such, during this phase, MEDCOM units inventory all systems, identify all their critical systems, assess each for millennium bug risks, develop strategies to address each risk, prioritize systems for fixing, and develop their contingency plans. The Renovation Phase requires MEDCOM

to replace, repair, or terminate systems to ensure Y2K compliance. Validation Phase activities include testing all systems for Y2K compliance and performing independent verification of all tested systems. Finally, during the Implementation Phase, MEDCOM will deploy renovated systems.

TIMPO's guidance applies to all automated medical information systems and network components that are used in military health system facilities. This includes all computer hardware, office automation software, network operating systems, and network components. The critical deadline to inventory and determine the year 2000 compliance of all automated medical information systems was Nov. 30, 1998. The deadline to replace mission-critical, non-Y2K-compliant systems was Dec. 31, 1998. The deadline to replace nonmission-critical, non-Y2K-compliant systems is March 31, 1999. By October 1998, MEDCOM had successfully met its target dates for both the Awareness and Assessment Phases, and the Renovation Phase of the DOD Y2K management strategy was well underway.

To assist its customers, TIMPO provides more information at its Y2K Knowledge Center on its website at <http://www.timpo.osd.mil/y2k/>. In addition to guidance, the TIMPO website provides Y2K-compliant manufacturers' lists, links to other Y2K websites, links to infrastructure vendors, and links to manufacturers' websites that offer information about fixes for non-Y2K-compliant equipment.

Medical Facilities

MEDCOM operates dozens of hospitals, laboratories, clinics and other medical facilities in CONUS, Central and South America, Europe, Asia, Africa, and the Pacific. Furthermore, MEDCOM operates three major Army installations at Fort Sam Houston, TX; Fort Detrick, MD; and Walter Reed Army Medical Center, Washington, DC. Responsibility for centralized planning for the medical facility millennium bug checkup is assigned to the MEDCOM Assistant Chief of Staff for Installation, Environmental, and Facility Management. His guidance for the millennium bug checkup and cure for medical facilities was provided in the April 29, 1998, MEDCOM memorandum, "Guidance for Assessment, Inventory, and Compliance Efforts on Facility Related Devices for Year 2000 (Y2K) Impact." The responsibilities to execute this guidance and to detect and cure the

millennium bug are tasked to the facility director or manager at each hospital, laboratory, clinic, or other medical facility.

Unlike the five-phase approach used for automated medical information systems, the procedure for facility compliance encompasses the following four steps:

- **Step 1:** Inventory facility devices and report the status of Y2K compliance assessment.

- **Step 2:** Estimate the cost to repair or replace non-Y2K-compliant equipment.

- **Step 3:** Develop an action plan and obtain funds for repair or replacement of non-Y2K-compliant equipment.

- **Step 4:** Meet the completion date for replacement of non-Y2K-compliant equipment.

The deadline to complete all four steps of the millennium bug checkup and to replace or repair facilities was Dec. 31, 1998, for mission-critical systems, and March 31, 1999, for nonmission-critical systems. To complete this requirement, commands accessed "toolbox" contracts (time and materials contracts that provide options to be used as needed) by contacting the MEDCOM's Sustainment Division Technical Assistance Team. Additional Y2K facility information was also provided by the U.S. Army Engineering and Support Center, Huntsville, AL, via its website at <http://www.hnd.usace.army.mil/omee/y2k.htm>.

Biomedical Devices

Probably the greatest concern to patients and MEDCOM is the millennium bug checkup and cure for biomedical equipment. The U.S. Army Medical Materiel Agency (USAMMA) at Fort Detrick, MD, provides centralized planning for the millennium bug checkup and cure for all Army biomedical equipment. In its April 3, 1998, guidance memorandum, "Biomedical Equipment Year 2000 (Y2K) Compliance Policy," USAMMA notes that it uses a five-stage compliance plan to check up and cure the millennium bug. Similar to the five phases used for automated medical information systems, the five stages for biomedical equipment are Assessment, Validation, Reporting, Implementation, and Certification.

Execution of the millennium bug checkup is performed by Y2K Biomedical Equipment Compliance Responsible Officers who are appointed by their command. To protect patients, stringent timelines were established to validate Y2K compliance of current biomedical equipment. To assist MEDCOM facility personnel in their millennium bug checkup, USAMMA created a centralized database in the Army Medical Department Property Accounting System that contains manufacturers' Y2K compliance responses to potential problems. This corporate approach reduces duplication of effort at local activities and helps prevent confusion in

obtaining information. USAMMA policy requires commanders to remove all infected biomedical equipment from service before March 31, 1999.

To assist in the identification and verification of biomedical equipment that is vulnerable to millennium bug infection, FDA established a website containing valuable information. The FDA Federal Y2K Clearinghouse is accessible at <http://www.fda.gov/cdrh/yr2000/year2000.html>.

The assessment of systems that were vulnerable to millennium bug infection required extraordinary efforts by all MEDCOM organizations. Altogether, MEDCOM examined more than 42,000 automated information systems, 750 facility systems, and 121,000 biomedical devices. Results from the assessment surveys indicated that between 4 and 5 percent of the total devices examined were infected with millennium bug problems that required the replacement of the equipment.

Millennium Bug Risks

In spite of MEDCOM's best efforts, preparation is still needed for a contingency plan in case a system fails on Jan. 1, 2000. For example, a system that MEDCOM tested and renovated could fail or a system that was outside the MEDCOM system but remotely connected could disrupt medical activities. In the face of such risks, MEDCOM must rely on continuity of operations plans (COOP) and contingency planning. COOPs provide MEDCOM activities a means to identify known or suspected millennium bug vulnerabilities and develop contingency plans that will overcome or mitigate unanticipated disruptions. COOP development is the responsibility of MEDCOM unit commanders. In March 1998, the General Accounting Office provided guidance, GAO/AIMD-10.1.19 "Year 2000 Computing Crisis: Business Continuity and Contingency Planning," to assist commanders.

Because of the very nature of medical-related issues, medical legal liability poses additional risks for MEDCOM that do not occur in other Army activities. The additional legal costs that could result from millennium bug failures in medical operations also increases the need for MEDCOM to deal with the millennium bug. An article by Warren Reid, "2001: A Legal Odyssey; *The Year 2000 Millennium Bug and You (And You Thought OJ's Trial was a Circus??)*," at <http://www.year2000.com/legal.html> discusses the liability issues resulting from millennium bug disruptions.

In developing their COOP and prioritizing risk management actions, MEDCOM commanders at all levels must perform critical path analyses that address liability issues to ensure actions for medical systems are undertaken first. Furthermore, MEDCOM commanders must fully document their support data for alternative

solutions and be prepared to document millennium bug disruptions when they occur.

MEDCOM is striving to make absolutely certain that devices such as anesthesia machines, infusion pumps, and ventilators are free of the millennium bug. The real challenge, however, is to determine if these devices have problems because of embedded computer chips. Another concern is that some manufacturers of medical equipment do not even know whether their devices will malfunction in the early minutes of 2000. As a last line of defense, MEDCOM commanders must rely on Y2K emergency medical response teams. These Y2K "SWAT" teams are there to ensure that vital life-sustaining equipment does not falter, and the transition to 2000 does not include any life-threatening millennium bug disruptions.

Conclusion

The millennium bug is a serious concern for MEDCOM and poses a potential disruption to U.S. Army medical activities. However, during the past year, MEDCOM made significant progress in protecting patients and preventing potential disruptions to medical operations. This was achieved through checkup and cure procedures for the millennium bug.

Guided by the DOD precept of centralized planning and decentralized execution, several DOD and MEDCOM organizations provided a millennium bug management strategy and are assisting with the checkup of medical information systems, facilities, and biomedical equipment. In addition, MEDCOM commanders are responsible for implementing the cure for any potential problems that are found. By following this approach with total confidence in the ability of its personnel to ensure the best of care, MEDCOM hopes to immunize itself against millennium bug infection and implement a cure for any Y2K illness the MEDCOM might contract.

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Introduction

The U.S. Army Corps of Engineers (USACE) is used to anticipating and responding to potential threats from a wide variety of man-made and natural disasters (e.g., hurricanes, floods, earthquakes, and blizzards). In 1996, however, USACE identified a threat greater than any disaster experienced to date—the year 2000 (Y2K) date change and its potential impact on all automated information systems. Unlike previous disasters, this one would be worldwide rather than local, and involve infrastructure that is difficult to conceptualize, technically complicated to find, and complex to test. The challenge to USACE was and continues to be ensuring its customers receive uninterrupted service through the turn of the century.

Initial Evaluation

Early planning for meeting the Y2K challenge involved identifying susceptible systems and equipment. As the list grew, however, so did our understanding of the complexity of the situation. The myriad systems, connections, and processes we discovered geometrically compounded the problem. Management realized that a detailed strategic plan was needed, as was an immediate effort to increase awareness of the potential risk throughout USACE. Management also realized that the effort could not be extended and would have to be completed by Dec. 31, 1999, to ensure USACE's continued operation on Jan. 1, 2000.

Strategic planning revealed that there were two primary areas of threat: facilities and systems now in place, and those being procured. Systems in place included everything USACE had ever built or received from others for operation.

DOD Guidance

The Department of Defense (DOD) initiated parallel efforts by all Services, with a high degree of coordination and information sharing in common areas of concern. DOD directed all elements to be responsible for their current assets and to avoid duplication of effort at individual facilities. DOD devised a five-phase Y2K management plan to ensure consistency and efficiency throughout DOD. These five phases are Awareness, Assessment, Renovation, Validation, and Implementation.

Strategies

With responsibility for facilities on the Army's camps, posts, and stations assigned to the Assistant Chief of Staff for Installation Management, USACE narrowed its focus to the facilities USACE operates and maintains (mostly those in the civil water resources arena) and to the USACE procurement infrastructure.

U.S. ARMY CORPS OF ENGINEERS BRACES FOR Y2K CHALLENGE

Kenneth E. Buck

USACE retained a commitment, however, to support other elements of the Army and the other Services if requested.

The USACE facilities strategy was tailored to its water resource mission, and the procurement strategy was directed at all procurement efforts regardless of the funding type or end use. Both strategies were implemented on concurrent timelines and assigned to the Directorate of Information Management (IM) at USACE Headquarters for overall coordination, in accordance with DOD policy. Each agency's chief information officer is responsible for his or her Y2K effort. The IM Directorate turned to the Civil Works Directorate as the center of expertise for the water resource mission and to the Principal Assistant Responsible for Contracting as the expert for all procurement efforts.

Facilities Strategy

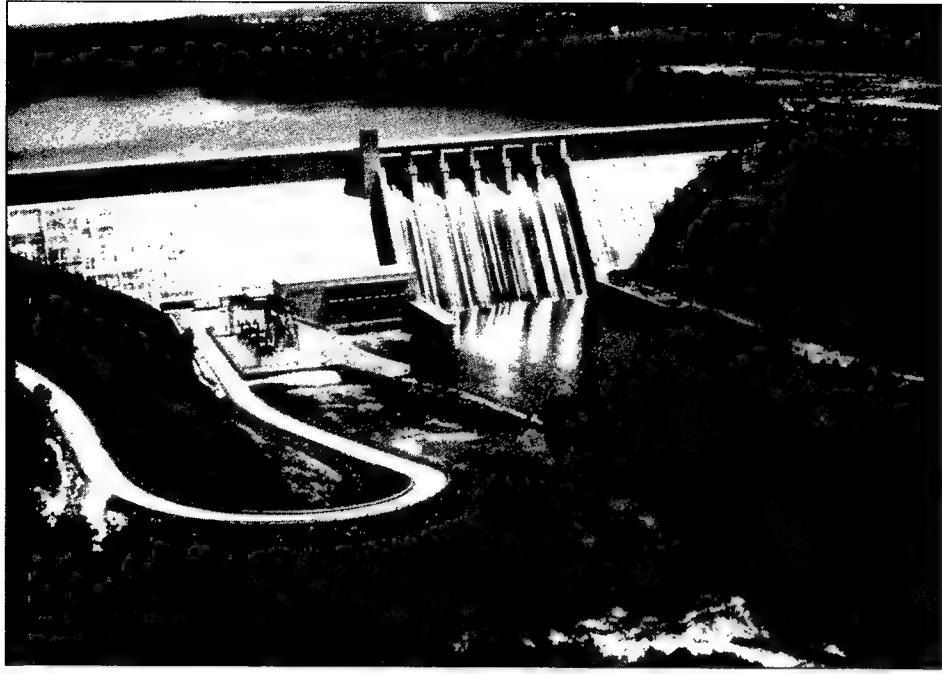
Because of the wide geographic distribution of facilities and offices within USACE, a central website (www.usace.army.mil/inet/functions/im/ceimp/y2k.html) was established to ensure access to all guidance. The website provides a forum for comments and lessons learned as the Assessment and Renovation Phases of the management plan progress; a speedy route for upward reporting to DOD, the Department of the Army, and USACE management; and a source of information for customers conducting their own Y2K verification.

USACE identified water resources business functions where Y2K could pose

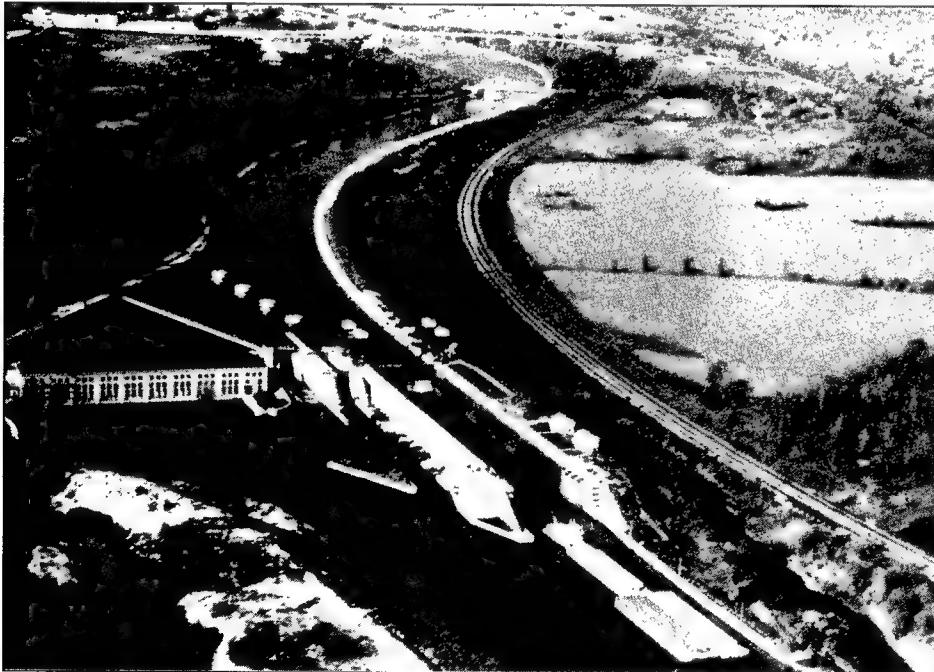
problems. These include construction and operation of locks, dams, and other structures along the navigable waterways of the United States; dredging operations to maintain inland waterways and coastal harbors; and hydropower facilities, water control structures, and reservoirs (USACE is the fifth largest power producer in the United States, selling power from its dams via commercial vendors and area power distribution grids). The responsibility for operating these infrastructure components is assigned to the Civil Works Operations Division, which provides management, supervision, and fiscal oversight to the 8 USACE divisions and 38 districts that actually operate the projects.

USACE began the Y2K compliance process for its facilities and business practices by determining the scope of work needed to assess its infrastructure. Feedback from all levels verified the need for consistency in reporting, and highlighted the need to define all terms, particularly "embedded controller" and "Y2K susceptible processes." An embedded controller is any computer chip with code-based or clock-based firmware that produces a time-derived output command to activate any other device. The intent behind use of embedded controllers is to reduce manpower needs and improve efficiency; therefore, these controllers lack human accessible input/output capabilities.

A piece of equipment or a system is susceptible to a Y2K problem if its effective operation is dependent on a date or time. For example, if a computer



This concrete dam is one of more than 450 civil works operated by USACE.



This navigation lock is one of more than 275 owned and/or operated by USACE.

"thinks" a maintenance date is overdue, it can shut down the associated system. Some of the more modern emergency generators and elevators operate in this manner. By focusing on these elements, USACE was able to categorize its process of searching for potential device failures. USACE was also able to identify similar devices in all parts of the country and include them in its periodic maintenance program.

Water Resources

Strategies in the USACE water resources mission, however, focused on far more than controllers. Y2K susceptible processes could potentially include any process using electronic devices having clock chips, basic input/output system, software with date-recognition features, data processing capability, or data fields.

USACE has located more than 19,500 electronic devices requiring detailed inspection. In addition, approximately 178,200 devices related to information systems and information technology oversight were identified. At the end of September 1998, about 60 percent of all devices were Y2K compliant; 15 percent were in some interim stage of verification or repair; and about 25 percent of the total devices had not yet been checked, but all were scheduled to be compliant by December 1998. Current information on USACE progress can be found on the web page previously cited.

Navigation

None of the navigation business centers operating the locks and dams on USACE's 12,000 miles of waterways, such as the Mississippi and Ohio Rivers, use embedded processors for control functions. Lock operation controls are all capable of manual override and manual operation, reducing the risk of impact from the century change. Navigation facilities have current emergency operating procedures for cases such as power outages, ice storms, and floods. These plans generally call for additional personnel at the site to overcome the emergency conditions and to continue facility services without interruption. These plans were found suitable for the century rollover event without change. Although automatic processors were introduced by management about 15 years ago to reduce the workforce, they can be operated manually, if necessary.

Hydropower

USACE also found that its hydropower systems do not use embedded controllers for control functions and are all capable

of manual override and manual operation. Connectivity to the power grid and the customer, however, could be a complication since the non-USACE owned systems could include embedded controllers that could fail, causing a disruption of power even though the USACE facility remains online. We are currently working with the Bonneville Power Administration (a Department of Energy operating unit), the Bureau of Reclamation (a Department of the Interior operating unit), and commercial power distributors to test interconnected systems for Y2K compliance. Systemwide tests are currently being planned as a step to a higher level of assurance.

Greatest Vulnerability

Water control systems are potentially USACE's greatest Y2K vulnerability. So far, no mission-critical failure modes have been identified for embedded processors. All controls are capable of manual override and manual operation; however, ensuring the availability of the increased number of trained personnel to accomplish this manual operation will require careful planning.

Key Factors

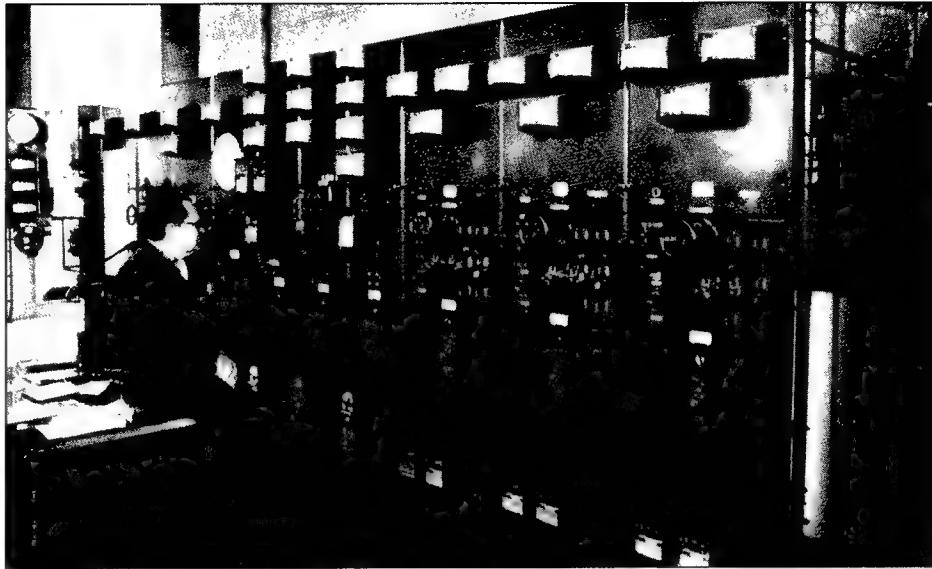
Two key factors in USACE's assessment process are communication with customers and risk-level judgment. In particular, USACE saw a need to communicate with its business partners and customers whose systems—such as power grids, navigation equipment, and water control instrumentation—are connected to its facilities and who use extensions of its systems for product delivery, requiring interface and effective backup systems.

Relative to the second factor, risk-level judgment, USACE has evaluated what it believes to be the most important devices first, and saved the controllers in less essential equipment (such as video cassette recorders and photographic equipment) for last. In addition to focusing the evaluation on items of high importance, risk-level judgment also concentrates repair dollars and manpower on the technical attributes of the systems rather than on ways to avoid Y2K litigation.

In the end, final implementation of procedures will involve reliability tests for USACE systems as well as interconnected communications and delivery networks. Testing will confirm compliance and identify "eccentricities" of the millennium rollover and leap year.

Procurement Strategy

The procurement strategy involves



Typical control panels in a hydroelectric powerhouse. USACE produces about 24 percent of the nation's hydropower.

contracting controls to ensure that noncompliant systems do not get into the USACE inventory. This requires an assortment of measures affecting all types of contracts, including service contracts for architectural and engineering design work, inspections, construction, and small purchases.

The first priority was to require compliant devices for designs currently in progress. USACE issued Engineer Technical Letter 1110-3-492 to provide guidance on Y2K compliance in specifications and drawings for new facilities. In concert with this action, we directed all contracting offices to incorporate the new Y2K contract clauses mandating contractor compliance into existing and future contracts. We then issued a construction bulletin providing guidance on acceptance of work and verification of Y2K compliance in all new facilities. This guidance applied to all purchases—from small items using government credit cards to the largest turbine engines and generator units for hydropower plants.

Conclusion

What are some of the factors that contributed to USACE's success in dealing with the Y2K problem thus far? First, tailoring the DOD Y2K management plan to USACE's business functions resulted in a series of effective decisions. Second, transmission of accurate data and using the Internet resulted in timely decisions and gave us the ability to see the impact of these decisions and other guidance in a short period of time. Finally, recognition

of the current emergency operations plans as applicable to the century rollover event complemented USACE processes and increased the confidence of minimal-to-no customer impacts.

USACE has by no means finished its process of preparing for Y2K, but we are confident that when Jan. 1, 2000, dawns, our systems will be ready for the next 8,000 years of operation.

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CECOM Y2K WEAPON SYSTEMS MANAGEMENT PROGRAM

Introduction

The U.S. Army's ability to shoot, move, and communicate relies heavily on the mission-critical systems managed by the U.S. Army Communications-Electronics Command (CECOM). If the Army's weapon systems computers were to fail at the beginning of the year 2000 (Y2K), Army operations at all levels could be impacted by the incorrect processing of data, corrupted databases, or even by massive system failures. In turn, this impact could result in such problems as weapon systems failures, delays in supply shipments, faulty inventory forecasts, unreliable budget estimates, and erroneous personnel-related information. The Y2K problem could also lead to a degradation of the Army's ability to maintain combat readiness by seriously slowing down or curtailing its ability to sustain the warfighter's vital supplies and information.

The Y2K Problem

The Y2K problem is rooted in the way

**Myron S. Samuel
and SFC Roxie Blackmon**

dates are recorded, computed, and transmitted in automated information systems. For the past several decades, systems have typically used two digits to represent the year, to conserve electronic data storage, and reduce operating costs (e.g., 97 representing 1997). With this two-digit format, the year 2000 is indistinguishable from the year 1900, and the year 2001 is indistinguishable from the year 1901, and so on. As a result of this ambiguity, systems or application programs that use dates to perform calculations or to sort may generate incorrect results when they are working with years after 1999.

This seemingly minor problem represents a potential threat to the Army and CECOM in sustaining their

important missions. Presently, no one can determine with absolute certainty the impact of this change-of-century event on Army and CECOM mission capabilities. Attacking the Y2K problem is a top priority for every Army and CECOM organization. It should be noted that the Y2K problem is not limited to automated information and weapon systems; the problem includes every entity that relies on a microprocessor, i.e., medical equipment, elevators, building entry control systems, street lights, fire suppression systems, and many other systems. For the Army, resolving the Y2K problem is a significant management challenge because all mission-critical systems rely on computers to carry out aspects of all operations, and time for completing Y2K fixes is rapidly running out.

Action Plan

In November 1996, recognizing the critical nature of the Y2K problem, the Commanding General, CECOM,

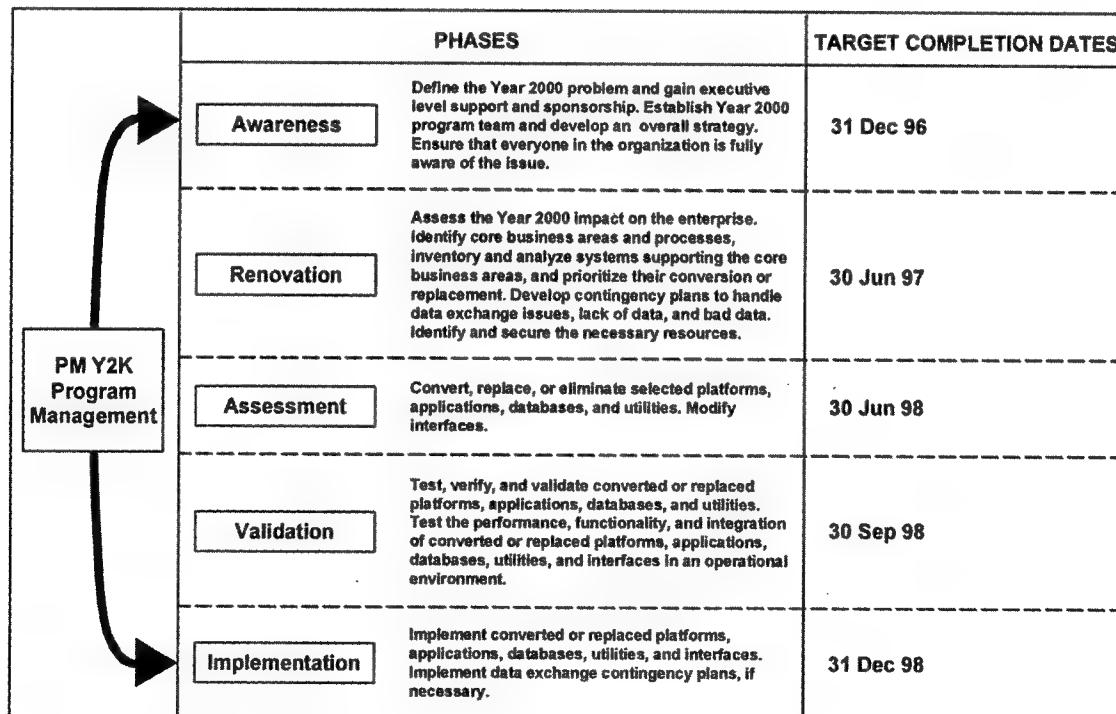


Figure 1.
Phase approach to Y2K remediation.

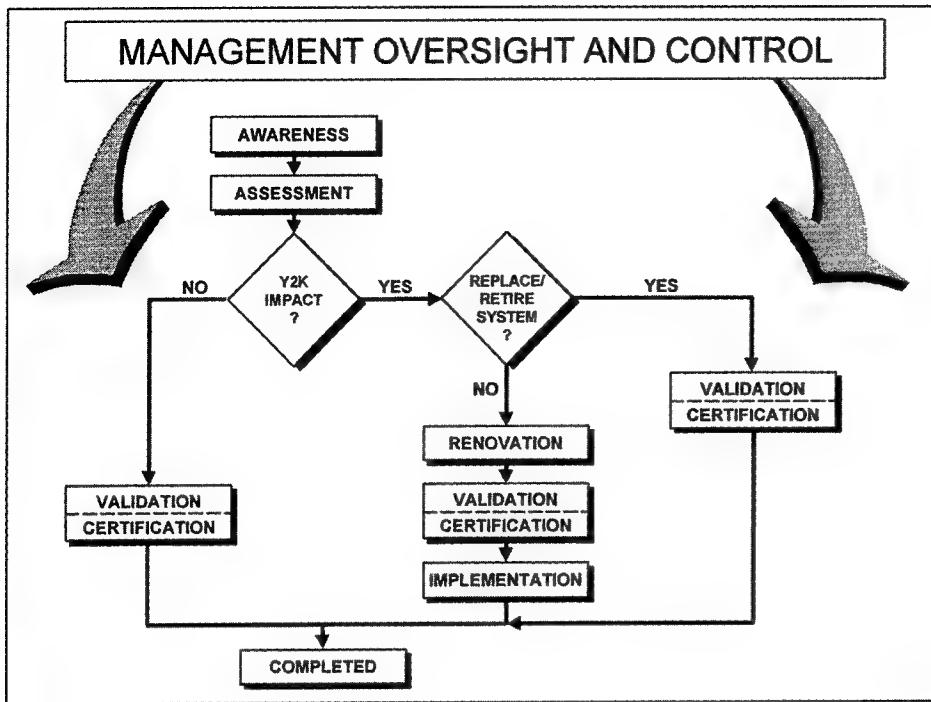


Figure 2.
Management process.

established and chartered the Project Manager (PM) for Y2K as the principal CECOM interface with the Department of the Army (DA), the U.S. Army Materiel Command, other project managers, and all CECOM activities worldwide to ensure the integration of all Y2K remediation efforts. The primary focus of the CECOM PM for Y2K is the planning and management oversight of all CECOM efforts. This planning and management strategy is documented in the CECOM Project Year 2000 Change of Century Action Plan, which parallels the DA Year 2000 Action Plan. Through the CECOM action plan, processes and procedures are in place to ensure the successful transition of operations into the next millennium.

Other excellent management plans exist for those interested in delving deeper into the subject. One comprehensive source of information can be found in the Department of Defense (DOD) Year 2000 Management Plan, dated June 1998, published by the Office of the Assistant Secretary of Defense (Command, Control, Communications and Intelligence). Part of the DOD Year 2000 Management Plan is a General Accounting Office Exposure Draft entitled, "Year 2000 Computing Crisis: Business Continuity and Contingency Planning," dated March 1998. In addition to the previously referenced DOD Year 2000 Management Plan, each military department has its own management or action plan, which is tailored to the needs of the individual Service, e.g., DA and CECOM action plans.

CECOM's approach to resolve its Y2K problem uses the five-phase approach that is being applied throughout the Army, DOD, and most government agencies, as presented in Figure 1.

The management process associated with the implementation of the five-phase approach is illustrated in Figure 2. Following the Assessment Phase, a decision was made as to whether systems were Y2K impacted. If an impact was identified, system replacement or retirement constituted a resolution to the Y2K problem since the system would be removed from the field prior to year 2000. If the system required remediation, the process would proceed with the Renovation (fixing), Validation, and Implementation Phases. If the system was not impacted by the Y2K problem, validation and certification of this condition would constitute completion of the process.

Scope Of Management Effort

The CECOM Y2K management effort encompasses the following major areas:

- Automated information systems, which encompass standard business systems such as the Commodity Command Standard System, the Standard Depot System, and the Army COMSEC Commodity Logistics Accounting Information Management System. This area also includes those unique and bridging systems that implement special CECOM mission requirements.
- Infrastructure, which includes desktop personal computers, peripherals,

commercial off-the-shelf equipment, e-mail, networking, mini and mainframe computers, and telecommunication devices;

- Weapon systems, which include strategic and tactical systems currently used by the warfighter in the field and future systems under development; and

- Facilities, which include heating, ventilation, air conditioning, traffic lights, fire alarm systems, elevators, intrusion detection systems, and inventory scanners.

Magnitude Of Y2K Effort

The magnitude of the CECOM Y2K management effort can be summarized with a few brief statistics. CECOM manages more than 300 weapon systems representing approximately 890,000 inventory items; more than 1,000 automated information systems representing approximately 31 million lines of code; approximately 140,000 infrastructure items; and in excess of 900 facilities inventory items. As of Sept. 30, 1998, most of the inventoried items have been fixed (Renovation Phase); most of the systems fixed have been validated (Validation Phase); and most of the validated files have been implemented (Implementation Phase). CECOM and the Army must and will ensure that every inventoried item is operable into the next millennium so that the warfighter is guaranteed successful operation of all systems.

Conclusion

While the magnitude of the numbers of systems and inventory items listed in this article presents a significant management challenge, CECOM expects no problems in meeting Y2K goals and objectives.

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ARMY MATERIEL COMMAND

YEAR 2000

QUALITY ASSURANCE POLICY

AND IMPLEMENTATION

GUIDELINES

Goals

The goals of the Army Materiel Command (AMC) Year 2000 (Y2K) Quality Assurance Policy and Implementation Guidelines are to validate the effectiveness of Y2K fix and testing strategies, and ensure data reported to HQ AMC and higher headquarters accurately reflect command progress. Quality assurance policy is intended to provide the necessary structure and guidance to prepare AMC for successful systems implementation efforts. The AMC Y2K Quality Assurance Policy and Implementation Guidelines provide a central information source governing the objectives of the four levels of quality assurance essential to system validation. The document provides a common set of methodologies to each Major Subordinate Command (MSC), Separate Reporting Activity (SRA), and Central Design Agency (CDA), and to HQ AMC. Consistent execution of these methodologies coupled with timely reporting and analysis should result in a thorough examination of AMC Y2K progress.

The AMC Y2K Quality Assurance Policy and Implementation Guidelines is an "umbrella" document intended to provide policy governing the execution of the quality assurance process. The appendices are key implementation tools that provide the methodologies and checklists for use during process validation management reviews and spot checks.

Process Description

Central to these policy guidelines is the development of a comprehensive and detailed quality assurance process. This process consists of four levels:

- *Testing and Certification.* Testing and certification are performed at the direction of system and program managers; all systems or families of systems are certified and tested in accordance with the selected certification level. Because of the specific technical and functional knowledge within the

Edgar F. Brasseur

system or program management office, testing is the core quality assurance activity representing the best opportunity for system validation. The focus of this review is on individual systems and their interfaces.

- *Certification Reviews.* Facilitated by the MSC and SRA Y2K points of contact, certification reviews provide an independent method of system certification and testing efforts and ensure system test results meet higher headquarters requirements. This level of review boosts the confidence of the first level general officer or Senior Executive Service (SES) officer in the system or program office testing and certification process. Consistent with the testing and certification process above, the focus of the certification review is on individual systems and their interfaces.

- *Spot Checks.* Led by the staff leads, spot checks serve to examine a random or purposive sample of compliant systems based on criteria established in their respective methodologies. The intent of spot checks is to provide headquarters-level technical and functional reviews of compliant systems. Feedback to the AMC Deputy Commanding General and first level general officers or SES officers provide solid indicators of MSC/SRA/CDA progress and offer significant validation opportunities. While spot checks examine individual compliant systems, they also focus on the capability to support the functional customer's business process.

- *Process Validation Management Reviews.* Conducted by the HQ AMC Y2K Project Team, these reviews examine the management of the MSC/SRA/CDA Y2K conversion process. They employ the Office of Secretary of Defense (OSD) phase exit criteria to validate completion

of required tasks, compare actual with reported organizational progress, and evaluate the role management plays in attaining Y2K compliance. As opposed to the system-level examinations listed above, management reviews focus on the organization and its management of the conversion process.

Conclusion

Collectively, quality assurance activities ensure the reliability of core AMC business processes through examination of technical and functional testing of organizational systems. Additionally, these guidelines ensure compliance with and documentation of the Y2K conversion process consistent with OSD, the Department of the Army, and AMC policy.

The success of the quality assurance process depends on involvement of senior leadership at every level. Fundamental to achieving the AMC goal of uninterrupted materiel support is the integrity of AMC core business processes, and the effective, continuous operation of supporting command systems. Commanders should continue to set priorities and manage resources accordingly to ensure continuous execution of core processes and their supporting operations. In summary, the quality assurance process is our insurance policy underwriting AMC's capability to provide continuous quality support into and beyond the year 2000.

EDGAR F. BRASSEUR is both the Deputy Chief of Staff for Corporate Information and the Chief Information Officer at HQ AMC. He is a graduate of the Pittsburgh Automation Institute, Pittsburgh, PA.

Introduction

Government and industry acquisition participants are increasingly subjected to a continually changing environment, including dramatic reductions in personnel and program funding, business reorganizations and consolidations, and the implementation of a multiplicity of acquisition reform initiatives, the overall objective of which is often summed up in the phrase "better, faster, cheaper."

Because of this changing environment, contracts must be awarded and administered correctly the first time. There are simply no extra dollars or additional time to be "thrown at" contractual problems the way we did in the not too distant past. The question is, "How do we change our culture from the traditional adversarial relationship that often exists throughout the acquisition community to a proactive, team-based environment that significantly enhances the effectiveness of communications between government and industry?" The answer is through the use of the partnering process.

To this end, the U.S. Army Communications-Electronics Command (CECOM), the Program Executive Office for Intelligence, Electronic Warfare and Sensors (PEO-IEWS), and the Program Executive Office for Command, Control and Communications Systems (PEO-C3S), collectively known as Team Command, Control, Communications, Computers, Intelligence, Electronic Warfare and Sensors (C4IEWS), expanded the scope of the partnering concept to enhance the effectiveness of communications with principal contractors and provide a forum for the exchange of ideas, discussion of problems, and formulation of better ways of conducting business.

What Is Partnering?

Before overarching partnering agreements (OPAs) can be discussed, the partnering process, which is at the core of OPAs, must be understood. Partnering is a mutual commitment between government and industry to work cooperatively as a team to identify and resolve problems, avoid disputes, and facilitate contract performance. It is an informal process that requires the parties to look beyond the strict bounds of the contract to formulate actions that promote their common goals and objectives. Partnering promotes the creation of a shared vision for success, synergy, and pride in performance. The partnering process is analogous to a three-legged race where the parties know that to successfully reach the finish line, they must cooperate and work as a team.

Partnering is not a new concept. It has been used successfully since the early 1980s in construction contracting by both the private sector and the U.S. Army

A Winning Business Strategy . . .

OVERARCHING PARTNERING AGREEMENTS

Mark A. Sagan

Corps of Engineers (USACE). The U.S. Army Materiel Command (AMC) expanded the use of the partnering concept into research and development, materiel acquisition, base operations, and engineering and support services contracting. Partnering is also an integral part of the AMC Alternative Dispute Resolution (ADR) Program, which focuses on the avoidance of contract disputes before they impact contract performance.

AMC's Partnering Guide

In April 1997, AMC published its *Partnering for Success Guide*, which is designed to promote government and industry communication and teamwork throughout the acquisition process. The guide explains the partnering process in detail, sets forth a four-step model partnering process, and includes an extensive appendix that contains a variety of samples, formats, and answers to commonly asked questions about partnering.

Benefits Of Partnering

The results of AMC, USACE, and private industry using the partnering process have been consistently impressive. Litigation has essentially been eliminated, and claims, cost overruns, and performance delays have been

significantly reduced. Furthermore, numerous participants in the process have found that their involvement in a partnered contract has significantly increased their morale, professionalism, and job satisfaction. These perceptions are directly attributable to the empowerment and ownership role in the process that is at the heart of the partnering concept.

Partnering significantly enhances the effectiveness of communications between government and industry and dramatically facilitates contract performance. Some of these benefits are as follows:

- Establishment of mutual goals and objectives in lieu of individual positions or agendas.
- Replacement of the "us vs. them" mentality of the past with a true "win-win" philosophy and partnership for the future where the parties recognize "we're in this together."
- Elimination of surprises that result in program delays, increased costs, claims, and litigation.
- Enabling the parties to proactively anticipate, avoid, and expeditiously resolve problems through the development of action plans that identify the problem and its cause.
- Resolving disputes through a clearly

defined conflict escalation procedure, a three-tiered process that includes the essential participants in the partnership. All of the participants know that they will have a fixed number of days to resolve any issue. If they fail to do so, the issue will be automatically escalated through the second and third organizational levels. This procedure avoids inaction and precludes the festering problems. Most importantly, however, experience has shown that almost all issues are successfully resolved at the lowest organizational level.

- Avoiding the expense, delay, and mistrust caused by formal litigation through the implementation of an ADR procedure.

- Reduced paperwork and the necessity for "documenting the file." The reduction in paperwork is facilitated by the "real time" simultaneous review of contractual documentation such as technical data package changes, engineering change proposals and contract data requirements list submissions.

- Improved employee morale and enhanced professionalism in the workforce through the empowerment of team members.

What Is An OPA?

When the partnering process is used in conjunction with an individual contract, one of the essential tools developed during the initial partnering workshop is the partnering agreement. This document, which sets forth the parties' mission statement, mutual goals and objectives, and commitment to the partnering relationship, is the focal point of their relationship and the blueprint for their future success.

The essence of the OPA is the recognition by the government and contractor participants that in an era of constantly diminishing personnel and financial resources, we can no longer afford to continue doing business in the traditional, adversarial ways of the past. Accordingly, in the first paragraph of the OPA, the parties commit to use the partnering process in each of their future contractual efforts. Most important, however, is the overriding objective established by the parties: providing America's warfighters with the most technologically advanced and highest quality supplies and services in a timely manner to promote the swift, safe, and successful accomplishment of their missions.

The majority of the OPA focuses on the commitment of the parties to execute individually designed and tailored partnering agreements in conjunction with each new contract award. The OPA also identifies the key partnering tools that must be developed to advance each of

these contract-specific partnering agreements: the mission statement, including the parties' mutual goals and objectives; the identification of all potential obstacles to the timely and effective completion of the contract; the establishment of a tiered conflict resolution process; and a commitment to use ADR procedures to the greatest extent possible to facilitate the timely resolution of disputes and eliminate the necessity for litigation.

The OPA also encourages the parties to examine their existing contracts to determine the feasibility and potential benefit of incorporating a partnering agreement during contract performance. Additionally, it clearly indicates that the OPA shall not be used as a vehicle for the dissemination or exchange of any competition-sensitive, source selection, or proprietary information, or for the premature or unilateral release of acquisition-related information prior to its publication to industry in general.

Lastly, the OPA provides the foundation for the parties to continue to discuss partnering-related issues and acquisition reform initiatives on a periodic basis.

OPA Successes

In November 1996, Team C4IEWS and Hughes Aircraft Co. executed the first OPA in the Department of Defense. Team C4IEWS has subsequently entered into additional OPAs with Lockheed Martin Corp.; ITT Defense and Electronics; GTE Government Systems Corp.; Litton Systems, Inc.; Raytheon Systems Co.; Electronic Data Systems Corp.; and Harris Corp. Several other OPAs are presently in process. OPAs are signed by a senior executive of the corporation, usually at the chief executive officer or president level, and by the Commanding General, CECOM, as well as the Program Executive Officers for PEO-IEWS and PEO-C3S.

Team C4IEWS' experiences using OPAs have been extraordinarily positive. Not only has this concept provided Team C4IEWS with the opportunity to educate its major contractors on how the partnering process works, it also has created a unique environment for Team C4IEWS and the company to explain to each other what makes them "tick." These sessions, as well as the follow-on meetings, also served as forums for discussions about implementing new acquisition-related concepts, government and industry perceptions, biases and motivations, and ideas for the improvement and streamlining of the procurement process. Most importantly, however, the level of trust and meaningful communication amongst the participants has dramatically increased.

Edward Bair, Deputy Program Executive Officer, PEO-IEWS, stated the following

about the use of the OPA process by Team C4IEWS:

"The Overarching Partnering framework we have employed MAKES A DIFFERENCE! It has facilitated breaking down communications barriers on both the government's and industry's sides and enabled us to better understand common areas of strategic goals, interests and initiatives, while still preserving separate business objectives. Overarching partnering has been an enabling approach to foster, and even expedite, the kinds of cultural change and relationships we need to sustain the revolution in business affairs to which we aspire. Simply put, Overarching Partnering has been a catalyst for leadership to effect change in our cultures and business practices. I fully endorse and am committed to Overarching Partnering, as much as we need IPTs [integrated product teams] at the PM's [program, project, and product manager] level, to effectively execute our strategies as well as strengthen our mutual understanding and trust of how best to meet the capabilities needed for our warfighters, today and into the future."

Conclusion

From Team C4IEWS' perspective, the establishment of a true partnership with industry through the use of OPAs is precisely the kind of nontraditional "outside the box" thinking that acquisition reform is all about. Adherence to this strategy is imperative for us to be able to successfully accomplish our most important mission—providing the American warfighter with the most technologically advanced and reliable equipment in a timely manner.

NOTE: Copies of the AMC *Partnering for Success Guide* may be obtained from Stephen Klatsky at (703) 617-2304. Questions about the partnering concept and OPAs should be directed to Mark Sagan at (732) 532-9786.

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Introduction

The need to reduce operations and support (O&S) costs or the total cost of ownership for a system is now a veritable mandate for the program manager (PM). PMs traditionally focus on O&S costs during production, fielding, or deployment and later turn responsibility over to the Army Materiel Command during the operational support phase of the life-cycle model. Today's emphasis shifts toward upfront cost-reduction techniques to produce a more efficient, cost-effective product. Such emphasis is essential to develop systems that will be affordable and manageable throughout their life cycle. The Army's Grizzly Program is an example of product development teams emphasizing the use of logistics design influence activities reinforced with modeling and simulation to reduce O&S costs.

The Grizzly

The Grizzly is an armored, full-tracked vehicle built on an M1 Abrams tank chassis (shown in Figure 1). It provides combat mobility support to the maneuver force by creating breach lanes in enemy complex obstacle systems. It is a unique Army system designed to rapidly eliminate buried mines, reduce antimaneuver structures, defeat antitank ditches, and cut through wire emplacements. Each of these tasks is designed to hasten the safe passage of friendly elements through enemy maneuver barriers. The Grizzly has subsystems built specifically for accomplishing these tasks. The development challenge is one of subsystem integration into an affordable (life-cycle costs) platform that is supportable within the envisioned Force XXI environment.

A major consideration with this vehicle and its deployment to U.S. Army Engineer battalions is its potential maintenance burden. The Abrams-based system is a "new" platform for engineers, and the limited physical capacity of its two-person crew puts a premium on removing or reducing the maintenance workload. The Grizzly Program's definition and risk reduction phase demonstrated this need. Maintenance on the system proved difficult. Components were big, heavy, difficult to reach, and interfaced in a manner that made problem identification inaccurate and inefficient. The Project Management Officer feared that the advantages the Grizzly brought to mission accomplishment might be overshadowed by unacceptable supportability constraints.

REDUCING O&S COSTS THROUGH DESIGN INFLUENCE AND MODELING AND SIMULATION

LTC Donald P. Kotchman,
James R. Caravallah,
and Wesley L. Glasgow

Because system size, weight and accessibility problems had to be addressed before production, program leadership also focused on reducing or eliminating the vehicle's operational and support burdens during the engineering and manufacturing development (EMD) phase. A key aspect of the EMD design strategy mandated examination of logistics support issues and a means to ensure adequate logistics design influence across all product teams. The leadership team emphasized the importance of supportability concerns to all integrated product and process

development (IPPD) teams. Logistics personnel participated in all systems engineering decisions with full voting rights. Figure 2 outlines this process.

Traditional Process

In the traditional process, EMD affords ample opportunity to address program design influence issues. Appropriate contract scope exists to rework the design for producibility while logistics engineers review producibility concepts for supportability. The logistics community typically conducts a logistics demonstration (log demo) to evaluate

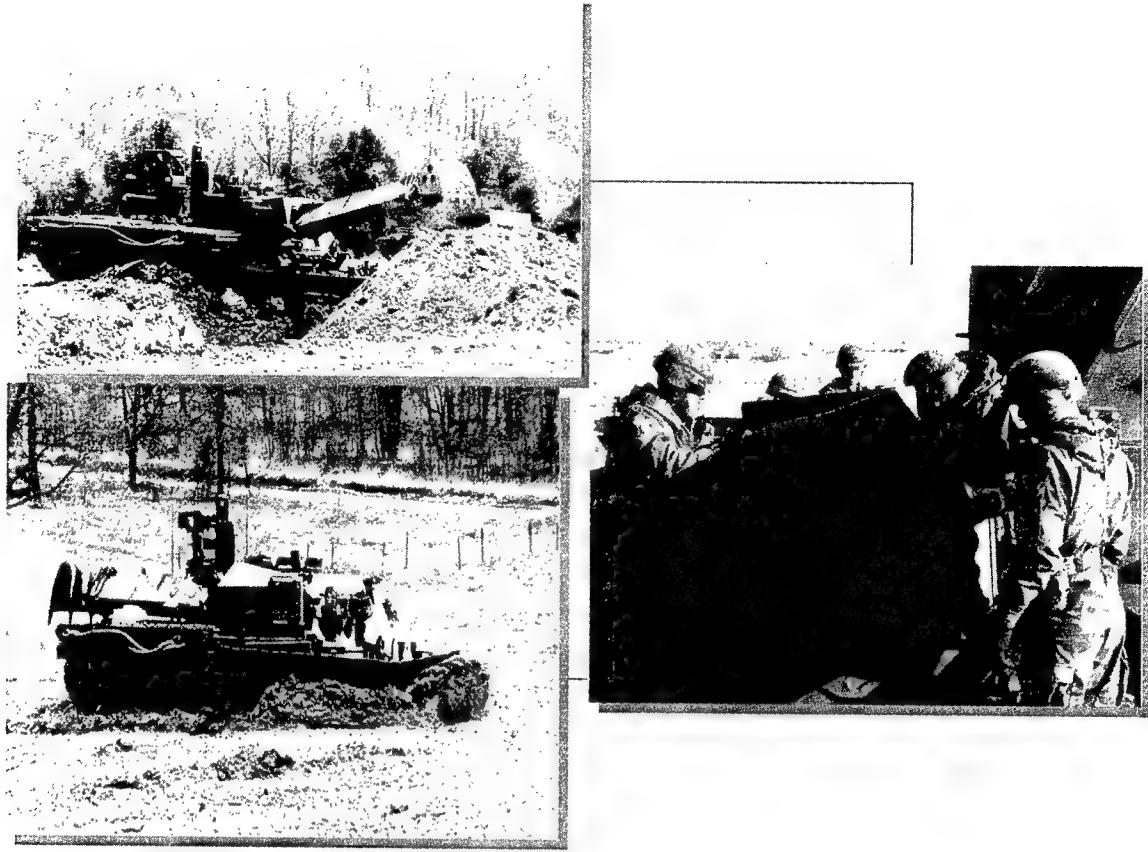


Figure 1.

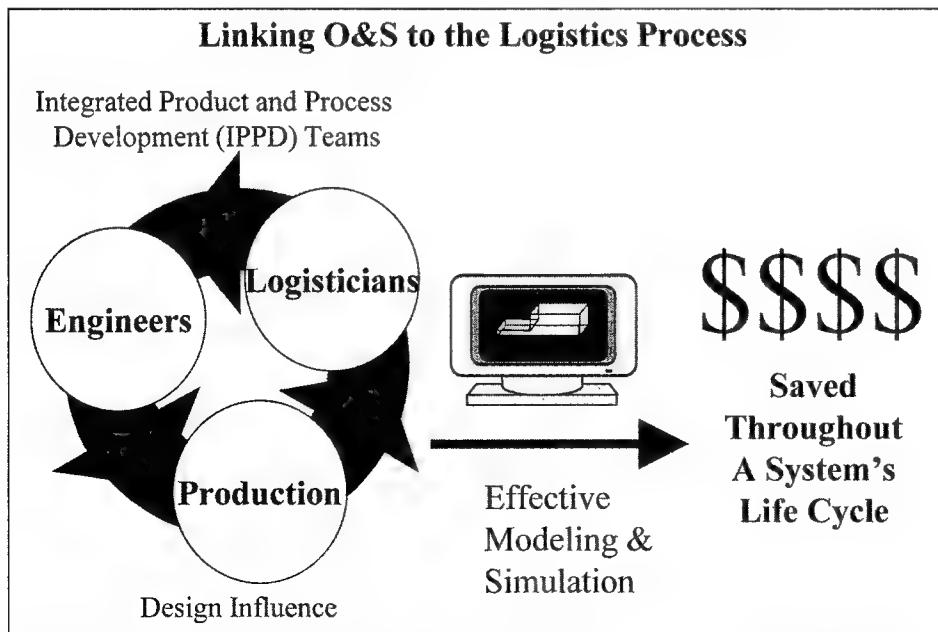


Figure 2.

supportability on one or more systems updated with all producibility changes. This is conducted before the system undergoes developmental testing to ensure that producibility changes do not alter system performance. Issues from the log demo are then resolved in a final update to the design before initial operational test, where test issues and any residual logistics issues are rolled into full-production configuration.

The Grizzly Program, however, does not have the budget or schedule to follow the traditional process. The program can afford only two prototypes for the pre-low rate initial production EMD effort, and the schedule does not permit releasing either vehicle for a conventional log demo prior to performance testing. The log demo is not possible until after vehicles undergo initial performance testing. The issue is then, "How should the program address supportability for test without a log demo and with limited asset availability?" The answer is, "Employ upfront intensive

logistics analysis and modeling and simulation tools."

Logistics Analysis

The Grizzly contract purchase description drove the prime contractor (United Defense, Limited Partnership (UDLP)-York) toward system-level responsibility in addressing mission requirements. Maintenance focused on a system-level 2-hour mean time to repair, and the entire maintenance effort emphasized the discovery of failures or degradations in mission-critical functions. Logistic engineers realized that to revise the design for Grizzly and produce reliable maintainability decisions, they needed to understand what made Grizzly "tick" in a mission scenario. A continuous crosswalk among the operational requirements document, the contract purchase description, design concepts, and a close relationship with the user helped accomplish this.

The analysis started with Grizzly's mission requirements and a few simple questions: "What components most affect the mission?" "How do these components interface to meet a mission

function?" "What is the criticality of each specific component?" "How does the failure of a component affect associated components?" "What's the mission outcome if component X or Y fails?" The analysis, essentially a robust government/contractor/user functional failure modes, effects and criticality analysis, helped analysts identify which components contribute most to mission accomplishment and aided in predicting mission effects of a component's failure (whether mission degradation or abort).

The resulting data, combined with reliability, availability, and maintainability component failure predictions, identified those items with a high probability of failure and those with extraordinary mission effects when they do fail. Design influence then focused on making those components more reliable or, lacking the resources to accomplish that, to determine the type and priority for diagnostic monitoring each should receive. The teams also paid close attention to component location to ensure that upon mission degradation or failure, the faulty component could be rapidly identified, accessed, and repaired

or replaced.

The analysis served as a basis for focusing design for both maintainability and diagnostic decisions during the preliminary design phase. The analysts prepared logistics system specifications both at the vehicle and the functional system levels to support the engineering design decision process. Instructions to designers focused on diagnostic concepts for each system under consideration. The outcomes provided an added benefit. When coupled with subsystem cost goals as part of the Cost as an Independent Variable Program, they helped balance operational cost against performance concerns.

Supportability Modeling And Simulation

Logistics program success will be clearly shown at the critical design review, the last chance to influence major design features for the system in EMD. The risk of an adverse logistics impact on Grizzly operations will be largely mitigated by computer modeling and simulation long before production material is assembled for the system.

GRIZZLY Physics Of Failure (PoF) Support Plan *Approach & Objectives*

Approach: Include electronics PoF methods during design, test and evaluation of the Grizzly. Scheduling or completion of PoF tasks does not delay or interfere with planned design unless PoF analyses indicate that a redesign should be considered. PoF has benefits in three primary areas: design, testing and sustainment.

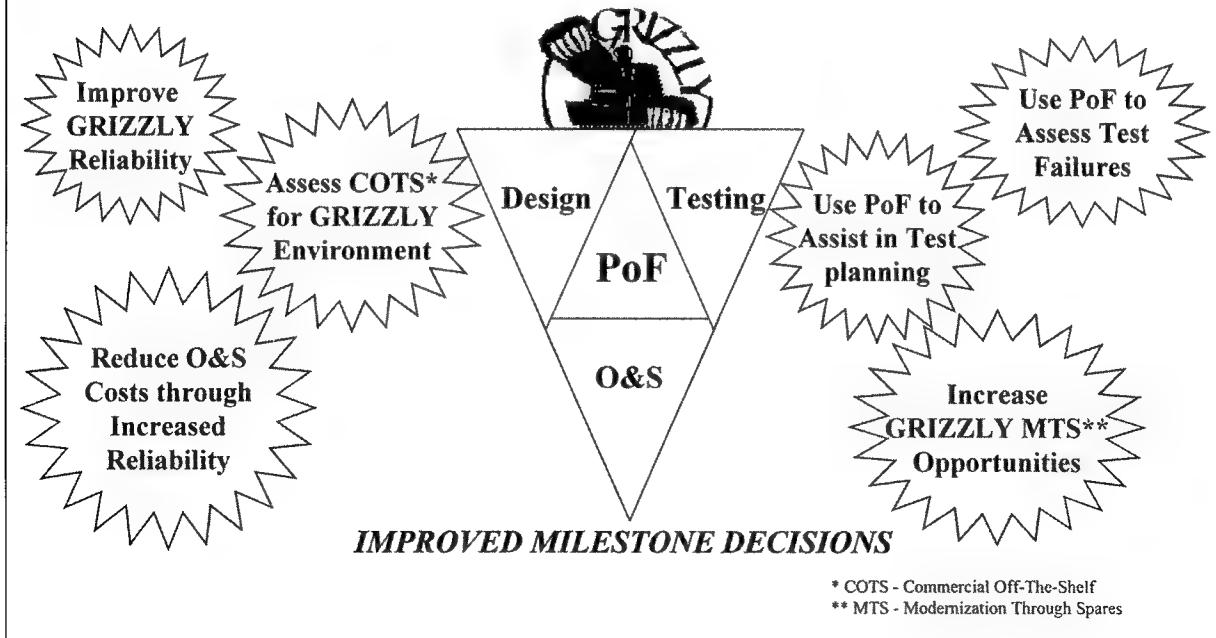


Figure 3.

Electronic "mock-ups," and their ability to meet supportability goals, were assessed as part of every program performance evaluation. Structures were created in the contractor's computer-aided design system, and components "installed and removed," to ensure they complemented one another in electronic media before being codified into preliminary design and production drawings.

Models for man-machine interface, such as the UDLP's use of the JACK simulation, were used to determine if equipment could be accessed or moved about in the area where maintenance must be performed. Likewise, models were used to present different screen display options, crew compartment layouts, periscope, and camera view angles of the area surrounding the vehicle to support simulation "user juries" before constructing mock-ups or building systems.

The process known as Physics of Failure (PoF) also offers potential in improving designs throughout the design, manufacturing and sustainment phases. Parts and components identified as critical in the logistics analysis are candidates for PoF analysis and testing both in parallel and nonintrusively during the development effort. Specifically, PoF techniques are effective at the circuit card and integrated circuit level to predict needed component changes to improve performance. PoF influences design by subjecting components to environmental loads and stresses that approximate or greatly exceed the levels expected under operational conditions. Figure 3 depicts the approach implemented for PoF in the Grizzly Program.

Systems Integration Lab

A similar process will be used to evaluate the electronic and hydromechanical system functions of the Grizzly in a systems integration lab (SIL). The SIL is a dynamic, instrumented simulation of the full vehicle where experimentation with component interfaces and operations will be demonstrated. In time, the SIL structure will include all the vehicle system components and their interfaces.

The SIL also serves to support quality acceptance of vendor-developed components and validates software integration as modules are developed. From a supportability standpoint, such operations as software maintenance routines, diagnostics evaluations, and some maintainability assessments can be run in the SIL. Goals established during the preliminary design phase are refined and adjusted using the SIL's "hot mock-up" long before the vehicles are assembled.

Tasks for the SIL evaluations include assessing quick disconnects and attachment devices for routine maintenance access, determining the location of diagnostic connectors, and ascertaining the use of software maintenance routines. SIL evaluations can also help alleviate user jury man-machine interface issues.

Level Of Repair Analysis

Analysis and simulation activities also support maintenance level of repair decisions. Both battlefield repair echelon and the economic feasibility of repair actions can be assessed taking a "similarity" approach. If a technology is similar to one already supported in the Army maintenance structure, it is logically a candidate for organic maintenance at the same level. For example, if economic analysis shows advantages in discarding a circuit card costing less than \$500 rather than repairing the module, Grizzly will likely follow a similar approach.

From the standpoint of reviewing existing technology, a formal level of repair analysis (LORA) is only conducted in borderline cost situations, where the cost to repair at a specific level can be mitigated by moving to another level, or by supporting a "fix or discard" decision. A formal LORA is not presently required for the technologies represented in the Grizzly. In the event that a totally new technology is required to support Grizzly's mission, LORA will be used to determine whether the investment should be made to make the resulting maintenance requirements organic or to identify alternative support methods.

Transportability

Transportability represents another area where modeling offers O&S cost advantages. The Military Traffic Management Command Test and Evaluation Activity has several means to monitor Grizzly transportability as its physical designs mature. Computer models can be used for space claim determination, weight parameters and impact testing. The effort promises to reduce costs for development and reduce the logistical burden. While not yet totally substituting for actual testing, computer modeling may help avoid the "Test-Fix-Test" development cycle—a solution that simply is impractical in the Grizzly Program.

The final EMD step is the validation/verification of the logistics support concept and gauging its impacts on affordability of the system. Operational testing is used as a simulation of what the vehicle faces in field conditions. In contrast with developing a logistics concept to support

testing, the support concept will be built into the environment that undergoes validation in testing. The test reporting system becomes the means to obtain feedback about the support concept's application under operational conditions.

Conclusion

Developers have long known that concepts are best identified in the planning phases before the proverbial "metal is bent," but the issues and questions have always been difficult to pose and refine while flexibility still exists to influence designs. When supportability is not adequately defined upfront, O&S costs rise as problems are discovered and rectified in fielded designs. The window of opportunity is brief to achieve real O&S cost avoidance. Logistics analysis and simulation in its many forms offer the Grizzly Program a good chance to capture the high ground in controlling O&S costs.

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21ST CENTURY MOBILE WEAPON PLATFORM

Introduction

Mobile weapon platforms, in many guises and differing configurations, are almost as old as warfare itself. Although by no means linear, the advance of the mobile weapon platform is clear. From the Egyptian fighting chariot to Hannibal's terrifying and seemingly unstoppable war elephants, to mounted knights wearing full body armor, to mobile artillery in the form of the horse-drawn gun carriage, mobile weapon platforms have been part of warfare.

During World War I, an armored mobile weapon platform was developed to break the impasse of trench warfare. Designed under the code name "water tank, front line," it has passed into history as "the tank." The strategic value of armor remained unexploited until Nazi Panthers overran Europe. Since then, the tank has been a crucial force in land combat and, as did its ancestors, has changed the face of war.

Today, mobile weapon platforms still share the two common features of their historical predecessors: force multiplication and advanced technology. They also share a weakness that plagued their ancestors, and that weakness has led to the evolutionary end of the tank. Simply stated, the cost to destroy a mobile weapon platform is a fraction of the cost to produce the platform. That, too, has been a historical trend.

The Hittites rolled logs in front of charging Egyptian chariots, which turned their onrush into a jumbled pile of shattered wood. Hannibal's behemoths were routed by bundles of burning brush tied to the tails of dogs. Knights discovered that crossbow bolts would drive straight through metal and flesh. The earliest cannoniers were "picked off" by the earliest sharpshooters whenever they ventured out to reload. Massed artillery pounded on the flimsy armor of World War I tanks. And the "bazooka" of World War II blew the treads off German armor with considerably less effort than it took to put them on.

The current worldwide inventory of tank killers is an overmatch to the combined threat of mobile armored weapon systems. Antitank munitions can be pod-mounted or hand-held, guided or fire-and-forget; the approach can be head-on, pop-up, or top-down. Antitank rocket sensors can "see" an armored target by its shape, its mass signature, and/or by its thermal signature. And land mines and armor-piercing depleted-uranium bullets can still destroy a tank just

Terrence Eugene Shirley

as thoroughly as can more sophisticated weapons.

In fact, the mobile armored weapon of today can be destroyed in more ways using a greater array of tools than could any of its predecessors. So, as it has many times during the past 4,000 years, the mobile weapon platform must metamorph once again.

The 21st Century Mobile Weapon Platform

The U.S. Army Abrams main battle tank is the finest armored vehicle in the world. That fact was clearly demonstrated by its superior performance during the Gulf War against Iraqi T-72 tanks, the world's second best. But the Abrams tank is not a weapon of the 21st century; it is a remnant of the thinking of the previous century.

An examination of antitank threats foretells the obsolescence of tanks. While the industrial and technical capacity to manufacture a tank is limited to a very few countries, the ability to manufacture antitank weapons is widespread. The Abrams may be the apex of armored capability, but antitank weapons continue to increase in lethality and diversity.

The tank, which is the epitome of mobile armored weapon platforms, must shed both its armor and its paradigm. To effect the kinds of changes that this weapon requires to continue to dominate the battlefield, planners and users must embrace the dictum "form follows function" as their design philosophy. A 21st century tank designed using "incremental evolution" as a guide would produce an improved but more vulnerable target.

The 21st Century Composite. The mobile weapon platform for the 21st Century, "Model 21-C," will be designed to use both existing components and newly developed technology. Central to the design philosophy will be the interchangeability of Model 21-C weapon and support systems with those of existing weapon systems. This will amplify the combat role of Model 21-C by increasing the number of missions it can perform while decreasing the logistical burden within the combat theater.

Model 21-C will be comprised of the main

body, steering and drive subassembly, electronics suite, crew compartment, and weapons. It will have rapid acceleration, a high top speed, be capable of engaging multiple targets while in motion, and have ballistic and environmental protection for the crew. It will be a critical element in the integrated battlefield management system, but it will not be a big chunk of steel.

Main Body. The low silhouette of Model 21-C will reduce both visibility and targetable surface area. It will not have a turret because it will not have a gun tube or a need for observation.

To avoid radar and shape identification, Model 21-C will be able to change its appearance using "deployable contour panels" that alter both its apparent radar cross section and its visible physical contours. It will also be able to alter its thermal signature with an "umbrella" having an electronically controlled phase-change material. The umbrella will simulate a particular kind of vegetation or nonmilitary, nonthreat shape.

To counter the threat of terminal homing or guided munitions, Model 21-C will have three types of decoys. Two passive decoys will replace flares and chafe to confuse heat-seeking and radar-guided sensors. In either case, a countermeasures rocket is deployed to detonate in the path of the threat. This will either deny or break the radar "lock-on-target" capability of the threat while the Model 21-C changes location and seeks to find and counter the threat. A thermal-cloud decoy can be either hot or cold by combining binary endothermic or exothermic chemicals. The size and temperature of the cloud will completely mask the targeted Model 21-C. A rocket-deployed metallic powder cloud performs in the same manner except that it produces a cloud of particles that denies a radar lock.

A radar echo simulator, designed to mimic the radar return of a tank, provides active defense. It will deploy at low speed along a ground-hugging path that emulates vehicular motion.

Model 21-C will have eight variably independent wheels with nondeflatable tires; that is, wheels that are selected by computer to provide the most effective motive force based on the demands of combat and the local topography. Wheels are less expensive and require less maintenance than treads, and up to four of them can be destroyed without disabling the vehicle.

Armor plate is increasingly less effective as protection against man-portable threats. So its use in the Model 21-C will be limited to applications where layered mass is necessary to protect the crew and the most valuable components. This critical-value armor will consist of a layered honeycomb of metal, ceramics, and woven composite plastics that absorb, disperse, and ablate incoming energy weapons. Reactive armor, bladders, and probe standoffs, however, will still have a place on the Model 21-C.

Weapon Platform. There is no need for a gun tube or a turret. Munitions and countermeasures will be launched from one of a suite of mission-specific canisters located within the weapon platform. A typical suite will have antiarmor, antiaircraft, and antipersonnel rockets in canisters that are individually articulated and fired. Javelin, HELLFIRE, Stinger, Multiple Launch Rocket System (MLRS), and 2.75 mm rockets, as well as Tube-Launched, Optically Tracked, Wire Guided (TOW) antitank missiles could all be adapted for use on the Model 21-C. The gunner will select either guided or fire-and-forget munitions based on the type of threat, the number of targets to be engaged, and/or the fire mission.

Weapon canisters will be self-contained and situated to protect the crew from "cook-offs." All interfaces between crew and weapons will be electronic, which means that the crew will not have to physically handle munitions. Reloading will be accomplished by ejecting empty canisters and inserting either a typical replacement load or a unique, mission-specific canister. Reloading can be done even while the load carrier and Model 21-C are in motion, thus making the process faster and providing less exposure after a fire mission is complete.

This concept will enable the Model 21-C to support or supplement other weapon systems. In its antiaircraft mode, the Model 21-C would be the equivalent of three Avengers. In an artillery mode, it would carry MLRS munitions. It could be fitted with a reconnaissance and surveillance canister suite. Regardless of which mission suite is inserted into Model 21-C, the crew and the load carrier would accomplish the change in the field with no additional logistics support.

Model 21-C could also carry dispensable and/or deployable tactical robots, called "symbiotes." These could be surveillance units, electronic intelligence gathering sensors, minefield probes, or mine dispensers, all of which could be either remotely driven or programmed for independent performance. Two pod-mounted machine guns with joystick aiming will provide self-protection and fire suppression.

Crew Compartment. Model 21-C will have a crew of two. The driver will operate the vehicle and maintain command communication links and other data processing functions. The gunner will be responsible for countermeasures, target acquisition and

tracking, and control of the weapons suite. Crewmembers will perform their duties from a semirecumbent position within the safety-sealed compartment.

The crew compartment will be the only portion of the weapon system that has traditional ballistic protection at levels similar to that of existing armor. It will be located in such a position as to use the mass of the weapon system as an ablative shield. It will also be "demountable" should the safety of the main body become untenable, thus saving a most valuable and reusable asset—the crew.

Electronics Suite. All components within the crew compartment will be field replaceable pull-out/snap-in units. It will also allow mission-specific weapons or equipment unique to the theater of operation to be installed in the field.

Built-in test equipment and diagnostic software will evaluate the performance of Model 21-C components. Model 21-C will have integral training software and an interface with off-line training systems.

The driver and the gunner will each have "real view" video monitors with commandable low-light level and infrared screens. Viewing range and angle will be controlled by computer and be digitally mastered for presentation. Model 21-C will also have a continuously updated position screen showing its relationship to other members of the unit and relevant terrain and warfighting features.

Benefits

Acquisition. Model 21-C without weapons will have a lower unit cost than the fire unit it will replace. As always happens when technology makes a leap, there will be an increase in the sophistication of the new system when compared to the old. That, in turn, increases the unit cost per pound. But Model 21-C will weigh less, resulting in a lower overall unit cost. The use of existing communications equipment, fire control and direction computers, identification friend or foe units, and other nondevelopmental items currently in military inventory will flatten the unit cost curve. No turret, less armor, and the use of common components all contribute to a lower production cost.

Sustainment. Three Model 21-Cs can be transported under the weight restrictions now in place for transporting a single Abrams. Two Model 21-Cs can fit into an International Standards Organization container.

Maintenance times and costs will be reduced. Treads and tread pads cost more than an equivalent number of tires and wheels, and must be replaced after fewer road miles. Its lighter weight and the requirement for less horsepower mean that the Model 21-C will use less fuel for theater operations than an Abrams, but will deliver more firepower.

Mission. The standard Model 21-C

weapon platform will carry a greater variety of weapons than any existing armored weapon. This means that the types of missions that the Model 21-C can perform will be more numerous than similar fire units. The Model 21-C provides commanders with more options for offensive action, a more comprehensive system to defeat threats, and a variable level of fire suppression. In effect, the Model 21-C would free other warfighting assets during an integrated mission by assuming multiple combat roles.

Personnel. Model 21-C will have two less crewmen than the Abrams, one less than the MLRS, and the same number as in collateral units. Fewer crewmembers will decrease sustainment costs by reducing overall division personnel requirements. It also means that fewer resources will be required to train the crew and keep them proficient. Model 21-C training would be designed so that the driver and gunner positions would be interchangeable should one crewman be incapacitated.

Conclusion

There is no technical problem inherent to fielding the Model 21-C. No aspect of the weapon represents a challenge to state-of-the-art weapons technology. The stealth technology now applied to aircraft can be adapted for protection of ground vehicles. The chemistry to create large, dispersed hot or cold clouds dates from the 19th century. Jammers and echo emitters are commonplace avionics equipment. All of the armaments comprising the weapon suites are already in the field. What is missing is the will to abandon the *elan* associated with armor.

The mission of Model 21-C is to engage enemy forces, survive, and to engage once again until the battle is won. If thick armor plate, the clacking of treads, and the panache of a commander's turret lessens the possibility of a successful mission, then these things must give way to other concepts.

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DEFINING THE OPERATIONAL CONCEPTS FOR THE CRUSADER SYSTEM

Dr. Linda G. Pierce,
Walter W. Millspaugh,
and William A. Ross

Introduction

Architects of Army XXI and the Army After Next are defining the battlefield of the future. A major building block of tomorrow's battlefield is the Crusader. The challenge is to design Crusader to exploit a technologically advanced battlefield even as that environment is being created. The operational concept

document (OCD) is critical to that process.

The OCD supports early definition or resolution of doctrinal issues and is used to transition weapons from acquisition to operational forces. Not only does the OCD define how a weapon system will be employed, but can, if developed early enough,

influence system design and define interface requirements for other battlefield systems. This article describes how the U.S. Army is using soldier-in-the-loop experimentation to examine the interaction between system capabilities and battlefield requirements to improve the system acquisition process.

Background

The Crusader will be the first of the "next generation" artillery systems. Scheduled for fielding in 2005, the Crusader includes a self-propelled howitzer (SPH) and a resupply vehicle (RSV). The SPH components will incorporate the latest in onboard and networked information processing and tactical-technical fire control capabilities. It will fire to a range of 50 kilometers with greater accuracy than current systems, at a maximum rate of fire of 10 to 12 rounds per minute, and a sustained rate of fire of 3 to 6 rounds per minute. It will have an unprecedented capability to mass fires with 4 to 8 rounds impacting simultaneously when fired from a single howitzer. The RSV will dock and automatically rearm the SPH with ammunition and fuel. Both the SPH and the RSV will match the mobility and speed of supported maneuver systems (Figure 1).

The Crusader OCD is a living document. It was initially developed using manual wargaming among military experts and lessons learned fielding predecessor systems. This conventional approach to OCD

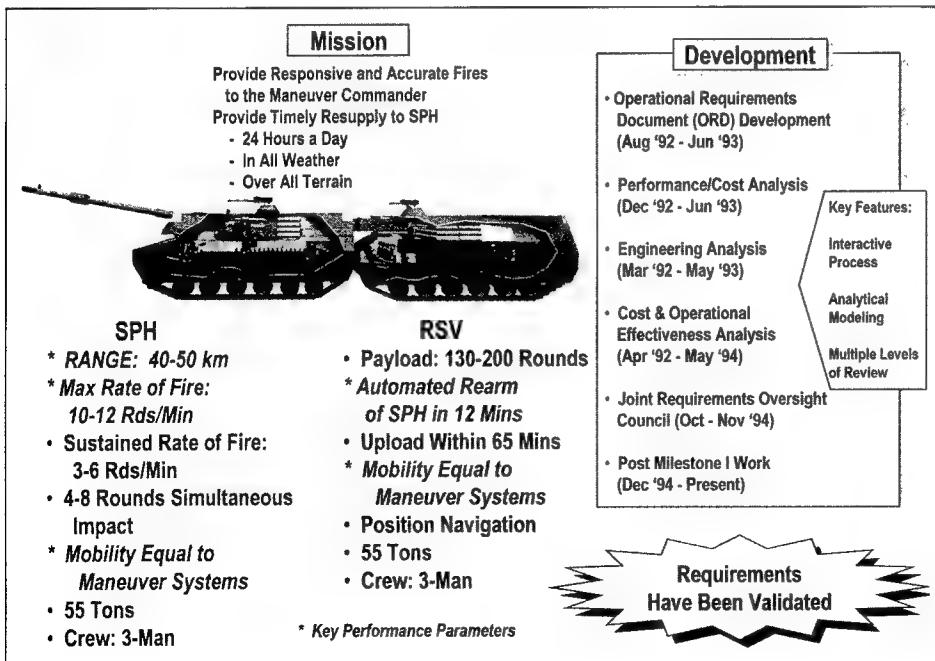


Figure 1.
Crusader capabilities.

development is inadequate since technological advances stimulate revolutionary changes in system design.

Fortunately, just as information age technologies are influencing tomorrow's battlefields, advances in techniques for conducting distributed interactive simulations (DIS) are changing how system performance may be evaluated. It is now possible to create a synthetic theater of war (STOW) that has the flexibility necessary for evaluation of conceptual systems on notional battlefields. The ability of DIS technology to support experimentation is best illustrated through a description of the Crusader Concept Experimentation Program (CEP). This is a multiyear program being conducted by the Army Research Laboratory, Human Research and Engineering Directorate, and the Depth and Simultaneous Attack Battle Laboratory in support of the U.S. Army Training and Doctrine Command System Manager for Cannon. The OCD functions as the foundation for this research (Figure 2).

Synthetic Theater Of War

The baseline OCD is used to generate a number of hypotheses for evaluation in the STOW environment. These hypotheses then drive design of experiments to validate, modify, or expand the OCD so that when the system is fielded, it will be accompanied by a doctrinal manual OCD based largely on experience and performance data derived from working with soldiers.

The pacing item for the first CEP was the development and implementation of a STOW environment in which soldiers, field equipment, prototype equipment, and models of things not yet developed (in this case, Crusader) could interact in a realistic battlefield scenario. The environment used was an amalgam of hardware and software both proven and developmental, as well as tactical data processing and communications equipment brought by the field artillery unit (Figure 3).

Live Simulations

In establishing the STOW environment, the first imperative was to

integrate fire support command and control systems onto the synthetic battlefield. To achieve this, a personal computer interface unit (PIU) was developed. The PIU allows fire support tactical data devices to be integrated into the DIS environment and onto the synthetic battlefield. Software converts the tactical data stream to a DIS-compatible message that is sent out over the network to other devices or simulations. In this manner, fire supporters use their actual fire support systems in communication with other live and simulated forces.

Constructive Simulations

To create the synthetic battlefield environment, J-Link (a developmental version of Janus), the Fire Simulation (FireSim) XXI (formerly Target Acquisition Fire Support Model (TAFSM)), and the Modular Semi-Automated Forces (ModSAF) model, all DIS-compatible, were configured and networked together.

Based on the World Modeler, J-Link was developed at the Naval Postgraduate School. It was used to

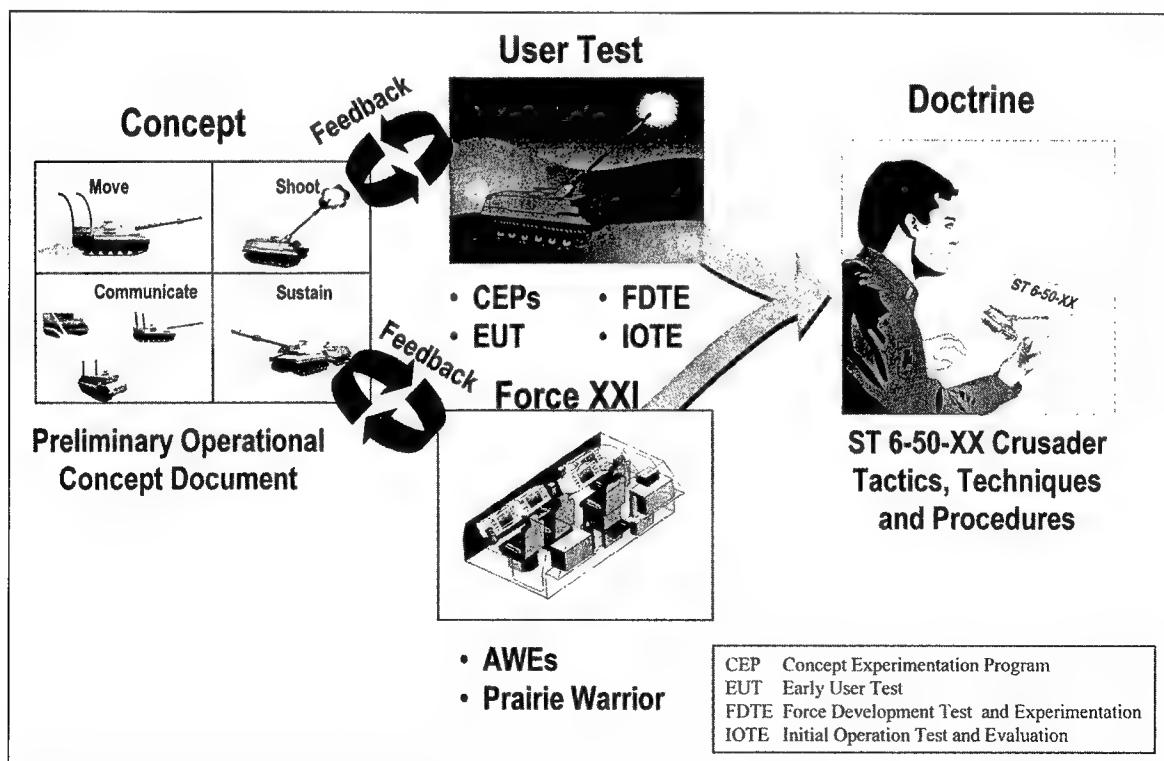


Figure 2.
Crusader doctrine development.

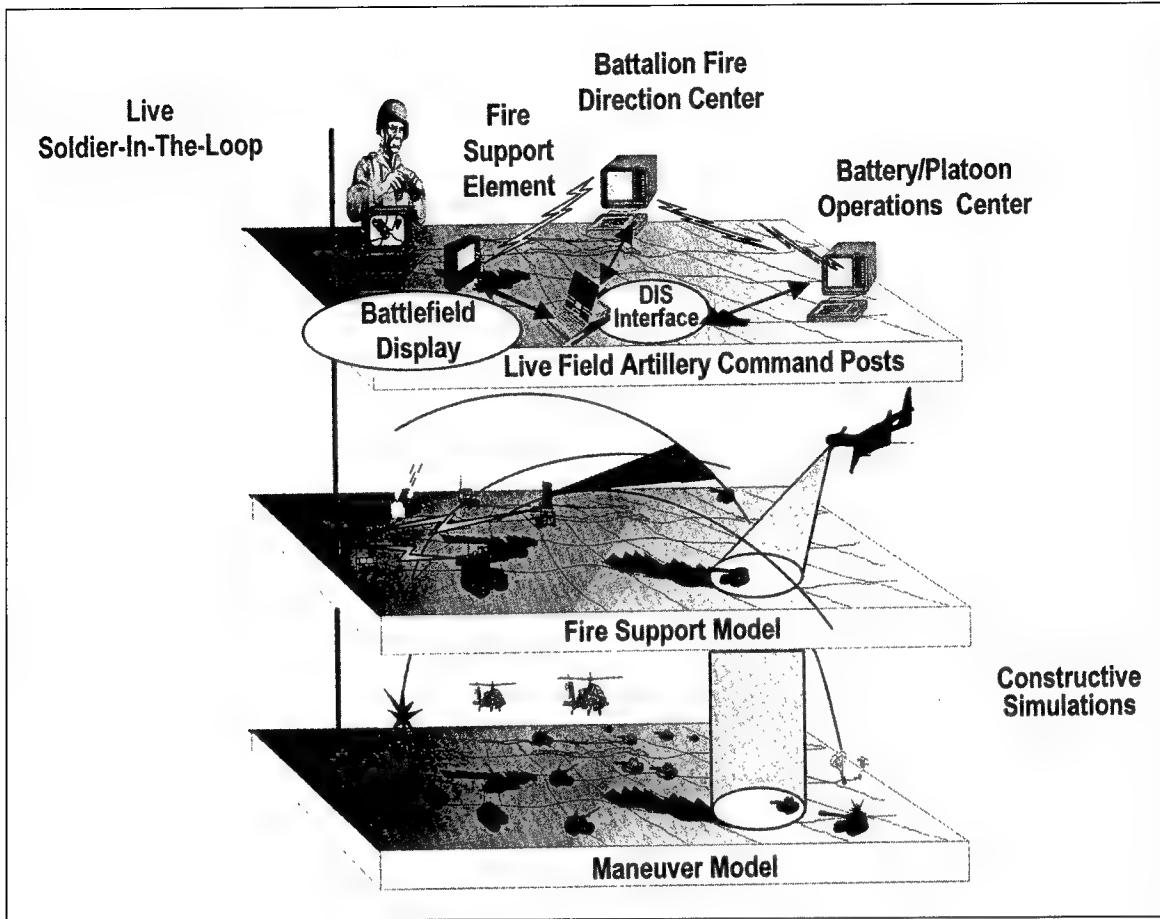


Figure 3.
Crusader synthetic environment.

provide the maneuver battle context and, more importantly, generate the fire missions that stimulate the Crusader systems to move, shoot, communicate, and rearm.

FireSim XXI is an artillery-oriented combat simulation developed at the Field Artillery School. It has been adapted as a simulation tool for use in the STOW environment. It simulates friendly and enemy artillery forces to include sensors; command, control, and communications; logistics; firing platforms; and munitions. It is both large scale (up to corps level for many applications) and yet highly detailed (individual sensors, weapons, fire direction centers, munitions, and messages).

The final piece of the simulation confederation was ModSAF, a highly detailed semiautomated computer-generated forces model that controls systems at the individual platform level. ModSAF was used in the CEP to replicate perfect situational awareness

at the brigade fire support element (FSE) to facilitate battle tracking and intelligence gathering.

Concept Experimentation Programs

In the Crusader experiment, task force commanders were role played by trained interactors who controlled the maneuver battle on J-Link. Task force FSEs were collocated with the J-Link screens to process calls to fire or to initiate planned fires. Fire support requests were processed to the appropriate tactical fire control node using the Advanced Field Artillery Tactical Data System. The fire missions were processed at the battalion and calls for fire sent to the Platoon Operations Centers (POCs), where weapons were allocated to the fire mission. POC operators then sent fire mission orders to computer-generated fire units (Crusader SPHs) in FIRESIM XXI, where technical fire control was performed. The SPHs executed the

missions, provided updated fire support status to the POCs and the forward observers, conducted survivability moves, and were rearmed by simulated RSVs in FIRESIM XXI. To complete the loop, impacting artillery rounds were displayed on the maneuver battlefield.

The experiments were conducted as a series of tactical engagements. Each engagement was initiated with the same force structure, arrayed in the same manner on the battlefield, but was fought based on the day's battle plans. A trained interactor using Soviet tactics played the opposing force. The experimental runs used a defensive Northeast Asia or an offensive Southwest Asia scenario for their diversity in operational requirements. Battlefield conditions or tactics, techniques, and procedures (TTPs) were varied based on the hypotheses and a predetermined schedule of events.

Results

The synthetic environment successfully supported field artillerymen in using the Crusader to provide direct support fires for the maneuver task force commander. Each engagement included features that demanded resourcefulness and required the unit to vary its tactics to satisfy the fire support requirements. As the engagements progressed, the battalion performed collective tasks needed to shift priorities of fires, maintain situational awareness, reallocate resources, and sustain operations. Events were catalogued and compared by run to determine the effectiveness of various TTPs and to develop performance trends. Various command and control arrangements were implemented including upgraded data processing capabilities at command and control nodes and for redistribution of assets within firing batteries.

Findings provided insight into how an artillery battle staff will manage Crusader's information and logistics requirements and highlighted the need for improved situational awareness as well as the need to re-evaluate roles and responsibilities of staffs at all levels of command. The integration of live and constructive fire support simulation provided an economical testbed for evaluating alternative concepts of operation and proved an effective training environment.

Future Challenges

Problems were encountered in chronologically logging and correlating the data required for analysis. Many activities conducted in the live world were not logged on the DIS network. Some of the tactical communication data were collected through special collection equipment such as the Fire Support Automated Test System and not easily correlated with messages not collected by that system. Major efforts are needed to develop methods for collecting and recording the proper data from the simulations and message collection devices so that the data can be logged and correlated at a central data collection and analysis point.

Digital data provide only one piece of the analytical requirements necessary to evaluate the impact of differential TTPs on system performance. There is also a need to improve our ability to evaluate team performance in an

Despite diminished resources, great technological strides are being made by using simulations, especially distributed interactive simulations, to support military training and operations, materiel acquisition, and research and development efforts.

operational environment. On future digitized battlefields, teamwork will determine successful system employment and, ultimately, battle outcome. Information systems must be acquired to support collaboration within and between teams, and TTPs for weapon systems must be developed to exploit information system capabilities. A comprehensive team performance measurement system is required. If the measurement system is implemented appropriately, the analyst and the warfighter will have the data needed to evaluate total system performance based on mission objectives and operations required for battle execution. A focus on total system performance during system acquisition is possible in the STOW environment.

Conclusion

ITG Paul J. Kern, Military Deputy to the Assistant Secretary of the Army (Research, Development and Acquisition) and Director of the Army Acquisition Corps, has stated that the biggest challenge facing the Army's acquisition community is the constant battle for resources. He acknowledged that we have more requirements and more good ideas than we have resources to meet those demands, but stated that "we must acquire and use what we acquire better" so that warfighters can use the fast-emerging

technologies to fight, survive, and win faster.

Despite diminished resources, great technological strides are being made by using simulations, especially distributed interactive simulations, to support military training and operations, materiel acquisition, and research and development efforts. With simulations, dynamic battlefields can be created and used by field artillerymen to execute realistic battles on notional battlefields using systems under development. All aspects of METT-T (mission, enemy, terrain, troops, and time) available can be quickly and easily varied, and battles can be repeated until research objectives are met. Simulations allow system developers to apply, early on, lessons learned on the synthetic battlefield to system design.

The fire support community, the Army Research Laboratory, and the Depth and Simultaneous Attack Battle Laboratory will continue to collaborate to advance the use of simulations in system acquisitions. Developing the STOW environment and our ability to use it to define and refine operational concepts for integrated system employment supports the acquisition strategy of LTG Kern and the requirements of our warfighters.

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FAMILY NIGHT AT PM-NV/RSTA

Suzanne Schmitz

Introduction

Acquisition reform. Funding lines. Delivery schedules. Improving Army readiness to keep up with constant technological advances and improvements requires more effort than a full-time job. Working 40 hours a week might be enough to dirty our hands, but real changes and improvements happen only when engineers, analysts, project managers, and their support staffs roll up their sleeves and rise to the daily challenges of systems procurement. The cooperation among coworkers, the hours spent on the job, and the work that is accomplished create a home-away-from-home atmosphere where our "extended family members" sometimes spend more time with us than our husbands, wives, and children.

The Office of the Project Manager, Night Vision Reconnaissance, Surveillance and Target Acquisition (PM-NV/RSTA) sought to bring these two families together on "Family Night," which is now an annual event. Each year, family activities feature demonstrations of night vision systems normally used in a business or military environment. The PM-NV/RSTA staff members display their accomplishments while family members experience hands-on entertainment, gain an understanding of the jobs being performed, and develop a sense of pride in their own contributions of continued support at home. The ultimate mission of the PM-NV/RSTA, of course, is to guard the lives of U.S. soldiers.

Demonstrations

Each of the demonstrations are designed with particular family members in mind. At last year's Family Night, a game of golf played in the dark was used to demonstrate the AN/PVS-7D night vision goggles. Outfitted in the helmet-mounted third generation image intensification goggles, and apprehensive about turning out the lights, our teenagers learned to maneuver themselves and their golf clubs while adjusting all of their senses to guide the ball toward a hole in one (but more often two, three, or four). Night vision goggles are used by individual soldiers for night operations such as driving, walking, administering first aid, and map reading. PM-NV/RSTA has fielded 140,604 of these goggles

under Omni contracts I through III, and has delivered 8,497 under Omni contract IV, with 3,049 more scheduled for delivery by FY00. An Omni V contract was awarded in June 1998 for the procurement of an additional 1,610 systems in Program Year 1.

Modular Night Vision Device

For the youngest family members, an after-dark Easter egg hunt was arranged using the AN/PVS-14 monocular night vision device for faces too small to see out of both lenses of the PVS-7D goggles. Children raced around several trees in a picnic area using their goggles mainly to find colored eggs, but also to keep from bumping into parents and each other. To date, more than 3,000 AN/PVS-14 devices, also used by the individual soldier for night tasks, have been fielded by PM-NV/RSTA under the Omni IV contract. A total of 25,258 of these systems will be fielded by FY02 under this new contract. Under the new Omni V contract, 5,495 additional systems were awarded for Program Year 1.

Driver's Vision Enhancer

For the entire family, a ride around the U.S. Army Communications-Electronics Command (CECOM) compound in a tactical wheeled vehicle with its lights off demonstrated the Driver's Vision Enhancer (DVE). In what felt more like a ride at an amusement park, five video screens in the back of the vehicle displayed for our families the thermal images the driver or soldier uses to operate the vehicle in the dark and in battlefield conditions of degraded

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of systems procurement.*

visibility. Families marveled at the white images of road and terrain used to navigate what was otherwise covered by the black of night. Under a limited procurement contract, PM-NV/RSTA has already fielded 412 of 1,189 DVE systems. In June 1998, a thermal Omni 3-year contract (with two option years) for the DVE was awarded for the procurement of an additional 408 systems in Program Year 1.

Heads-Up Display

Also for the entire family, a simulated view of the ground from an aerial flight at an altitude of 1,000 feet demonstrated the Aviator's Night Vision Imaging System/Heads-Up Display (ANVIS/HUD). The ANVIS/HUD collects and displays critical flight information (altitude, airspeed, attitude, torque, compass heading) from aircraft sensors and converts it into visual imagery, allowing the aviator to fly "heads up" without continuously looking down at the instrument panel. Families saw the ground from 1,000 feet with and without the benefit of the ANVIS/HUD, which produces a much clearer image of the ground that makes night flight safer for the soldier. PM-NV/RSTA has fielded more than 1,417 of these units.

FLIR Demonstration

The second generation Forward Looking Infrared (FLIR) Demonstrator Vehicle displayed the differences between first and second generation images used for target acquisition. Second generation FLIR is a standard thermal sensor that provides the Combined Arms Team (M1A2, M2A3 and M3A3) and the Long Range Advanced Scout Surveillance System (LRAS3) with the ability to detect, recognize and identify targets at significantly greater ranges. The standard thermal sensor, called the B-Kit, can be integrated into host platforms through use of vehicle-unique integration components called A-Kits. In the third quarter of FY97, PM-NV/RSTA awarded two 4-year, low-rate initial production (LRIP) contracts to procure 242 thermal imaging systems and 240 commanders independent thermal image viewers for the M1A2, and 260 B-Kits for the M2A3. Additionally, B-Kits for the LRAS3 Program will be exercised as options on these contracts. Compared to first generation FLIRs, second generation FLIRs will have a 55-percent increase in identification and recognition range. This will provide a recognition capability at or beyond the maximum

effective weapon range of a respective weapon system.

Video Reconnaissance System

Finally, for our families to take home with them, we printed family photos with the Lightweight Video Reconnaissance System (LVRS) and Thermal Weapon Sight (TWS). The TWS recorded the image of each family and sent it to the LVRS, which digitized and printed the image. The LVRS is a lightweight, self-contained system that operates in adverse weather and is used by combat units in conjunction with the TWS to transmit images of battlefield conditions to the tactical operations command. PM-NV/RSTA has an LRIP for 2,850 thermal weapon sights and will begin fielding them in the second quarter of FY99. Under the basic thermal Omni contract (excluding the option years) awarded in June 1998, PM-NV/RSTA will procure approximately 3,220 additional TWS systems. The LVRS is currently in full production, with an engineering change proposal to reduce the system weight from 15.03 pounds to 8.87 pounds.

Conclusion

Family Night has been a tremendous success for PM-NV/RSTA. Families associate faces with names and products with their acronyms. They realize the urgency and importance of what sometimes forces them to keep dinners warm and children up past their bedtimes. Once a year is not too often for reinforcing pride in our work and for showing appreciation to our families for their support. More families attend every year, helping to create an inclusive community where work and family are united by pride in their accomplishments.

For more information on any of the systems discussed in this article, please contact Suzanne Schmitz, PM-NV/RSTA Support Secretary, at (703) 704-1362.

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Introduction

Several articles have recently been published on Modernization Through Spares (MTS) as a concept of acquisition reform. For example, the May-June 1998 issue of *Army RD&A* included an article on the program manager's (PM's) perspective on life-cycle cost (LCC) drivers. That article identified a mandate for PMs to implement a systematic program consisting of a mix of upgrades and retrofits. A requirement for an MTS and "other investment means" was identified for use in managing the PM's system. Quoting the article, "... PMs must continuously attempt to incorporate aspects of technical [technology] insertion and reduce LCC." The article stated that the PM can accomplish this by, "Learning to analyze all of the data available on system cost drivers; leveraging resources normally not pursued by PMs; and ... making a commitment to life-cycle investment."

A Systematic Process

This article describes an MTS process that the Industrial Operation (IO) Division, System Engineering and Production Directorate (SEPD), U.S. Army Aviation and Missile Command has initiated during the past 2 years to achieve operating and support (O&S) cost reductions for program offices. Although stand-alone cost reduction programs at the project office level can result in significant savings, these efforts can achieve even greater savings when integrated into a focused investment and cost reduction strategy Armywide.

Integrating MTS And Resources

MTS has been applied for years through technology integration; Operating and Support Cost Reductions (OSCR); Reliability, Maintainability, and Supportability (RMS); Savings through Value Engineering; Horizontal Technology Integration (HTI), product improvements, etc. The major difference now is that the MTS concept formalizes LCC reduction initiatives into a strategy to ensure cost reductions are a consideration in all program and system management functions and decisions throughout the system life cycle. The MTS strategy complements and enhances research and development (R&D), test, production, and supportability cost reduction initiatives by leveraging acquisition reform initiatives and practices to

MODERNIZATION THROUGH SPARES IMPLEMENTATION PROCESS

Terry L. Mullins and
Barry K. Pepper

Although stand-alone cost reduction programs at the project office level can result in significant savings, these efforts can achieve even greater savings when integrated into a focused investment and cost reduction strategy Armywide.

ensure weapon system technology is continuously upgraded. With each spares procurement, an opportunity exists to modernize the item being bought. Command processes must be implemented to ensure these opportunities are examined and not missed.

A key point is that the approach does not look at MTS as a separate program, but as an umbrella concept under which multiple cost reduction initiatives fall. The overall objective of the approach is to leverage sources of funding other than program office R&D dollars to achieve cost reductions to modernize objectives.

Figure 1 identifies multiple funding sources and programs that can be used to accomplish the LCC reduction initiatives listed along the left-hand column of the chart. These initiatives

derive from acquisition reform efforts that the Department of Defense has been implementing for the past 4 or 5 years.

Life-Cycle Cost Reduction Process

IO-SEPD developed and defined a process that provides managers at all levels the visibility needed to make LCC reduction investment decisions.

The process in Figure 2 integrates multiple functions and organizations into a candidate identification, candidate analysis, candidate selection, and prioritization methodology to provide visibility of high-benefit, high-payoff investments. The operative term in this case is "visibility" of problems, so decisionmakers can decide on a course of action to resolve existing or potential problems.

The process depends on leveraging existing data and information with little or no new identification work being required. The process provides decisionmakers with a list of all problems that exist with an item so that multiple problems can be addressed and mitigated in one upgrade or modernization effort. Another feature includes a prioritization and funding assessment to ensure that investments are made in the most critical areas first. As problems are corrected, items will move up the list in priority so that a program has a continuous, updated investment list of improvements to make. Combining this list with the acquisition strategy, decisionmakers have the basis for an investment strategy that supports a program's proactive cost reduction effort.

The process is organized in a series of

Life-Cycle Cost Reduction Programs

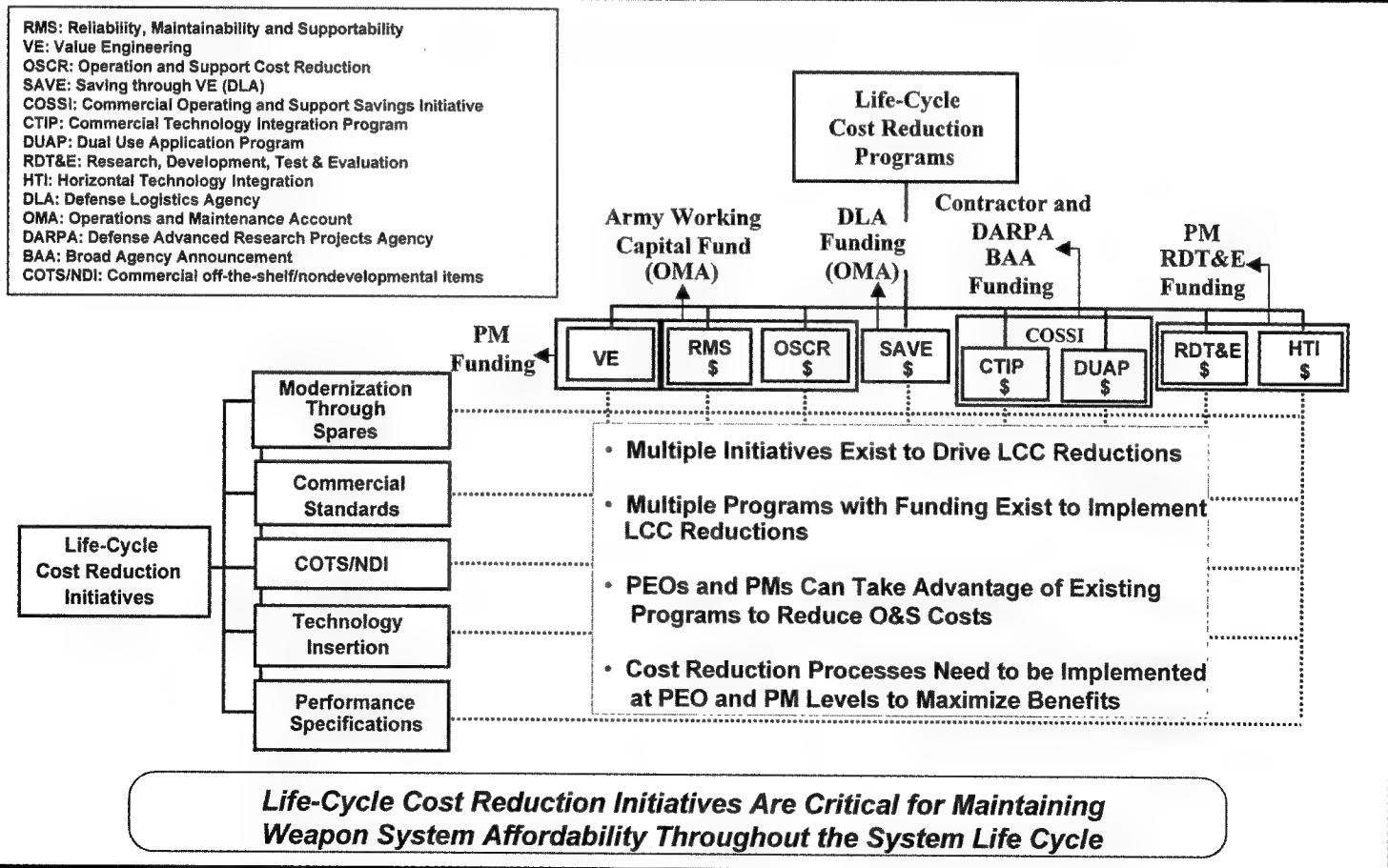


Figure 1.

logical steps to continuously identify opportunities to improve and modernize weapon systems. The methodology integrates consideration of other modernization opportunities such as technology insertion (TI), HTI, commercial off-the-shelf/nondevelopmental items (COTS/NDI), and performance specification to leverage funding already invested in other programs to improve weapon systems.

Step 1. Problem Identification. Step 1 uses and leverages data and information from existing data sources and personnel to identify problem

areas. Project offices, depots, field units, and industry are the sources for this information. This is a continuous process with each organization defining metrics to identify potential cost reduction candidates at the earliest possible point. This process leverages work being done routinely in each organization to drive an MTS process.

A representative set of types of problems that will be identified are shown in the problem set box in Figure 2. It is not all-inclusive and can be tailored as necessary. The key to the problem set is that individuals and

organizations are identified to focus on key areas that will indicate when problems are beginning to develop that will impact LCCs.

Step 2. Candidate Validation. In Step 2, data are collected on nominated candidates to ensure that the perceived problem is in fact a valid problem. Logistics data such as recurring procurements, obsolescence status, high-demand items, high-cost items, and high-overhaul requirements are assessed to determine the magnitude of the problem. Once this assessment has been completed, the decision is made

Life-Cycle Cost Reduction Process

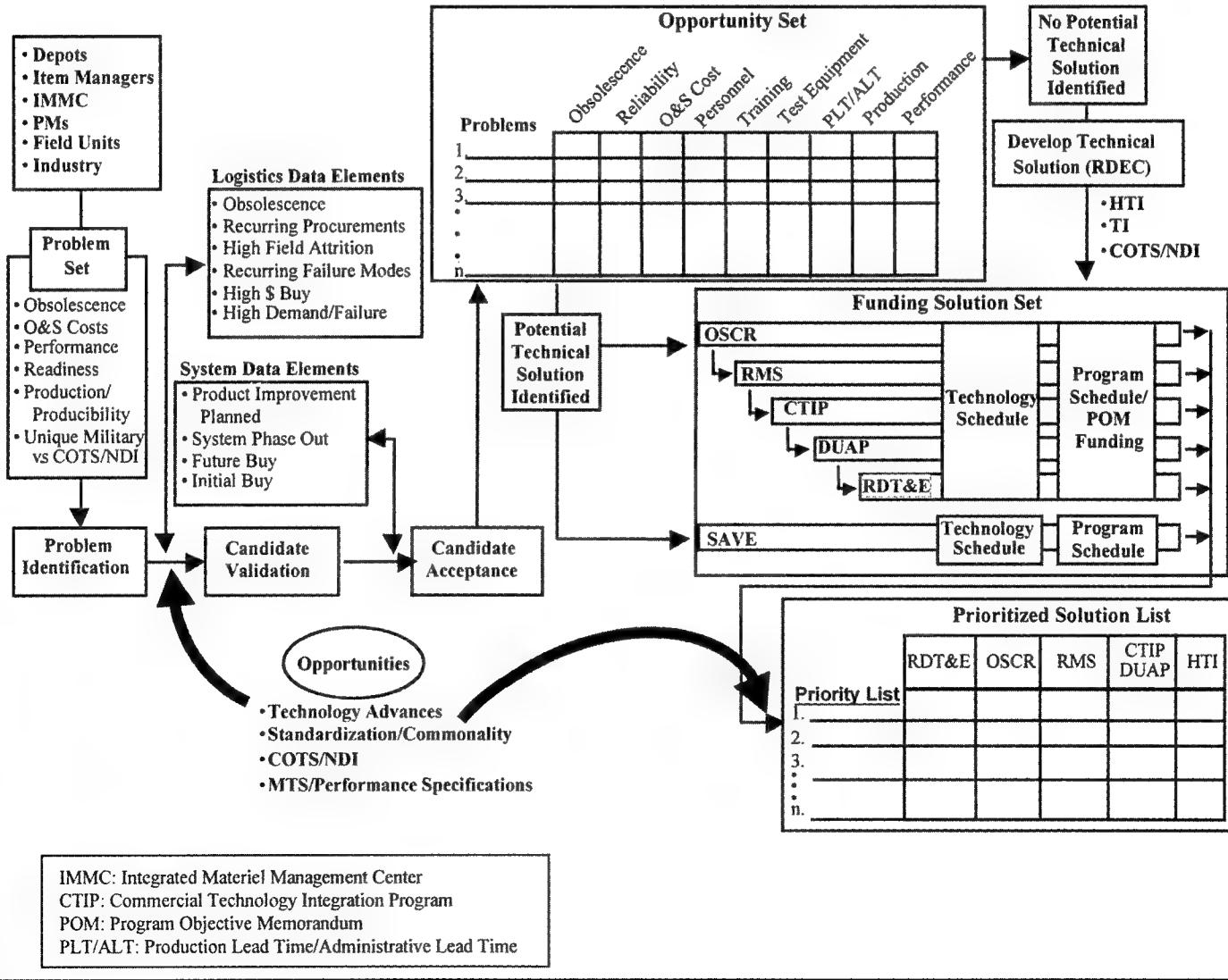


Figure 2.

***The MTS strategy
complements and enhances
research and development,
test, production, and supportability
cost reduction initiatives
by leveraging
acquisition reform initiatives
and practices
to ensure
weapon system technology
is continuously upgraded.***

as to whether this is a potential candidate. The result is a list of feasible candidates that are supported by actual logistics data.

Step 3. Candidate Acceptance. Step 3 ensures only valid candidates are considered. Here, project office information is collected for each feasible candidate. The objective is to eliminate any candidates inappropriate for expenditure of future funds. Items being phased out of the inventory, already being upgraded, no longer being procured, or that may have shown up in logistics demand data as a result of an initial buy are eliminated from consideration. A list of accepted candidates results from this step.

Step 4. Opportunity Set Development. The objective of this step is to capture all problems that exist with a valid candidate, and define improvement or modernization opportunities that can be implemented in a single investment activity. The list of opportunity areas shown across the top of the chart is representative and not intended to be all inclusive. Data from the logistics elements will be used in this step to complete the matrix for item opportunities. The opportunity set is very important to the process since information captured in this step will support development of a detailed economic analysis (EA). By considering all problems with an item, maximum savings that will produce a substantial

saving-to-investment ratio can be identified, increasing the chances for funding.

There are two paths from Step 4 to Step 5. If a modernization technology has been identified that will correct the opportunities in the matrix, the project can proceed directly to Step 5. If no technology has been identified, a technology or solution search must be conducted. The research, development, and engineering center and industry can be used here to identify potential technology solutions.

Step 5. Funding and Schedule Assessment. Once the opportunity set has been filled out, the candidates are screened against a number of funding programs to see if the candidate meets the criteria for submission. The programs listed in the process chart are funded on an annual basis to make O&S improvements to reduce LCCs. RMS was an unfunded program in FY98 but remains on the list to consider depot level items that will achieve cost reductions. Each program has its own distinct set of criteria and submission schedules and each will require a validated EA. The IO-SEPD has built a support capability to assist in deciding on the correct programs to pursue and for developing a validated EA.

Step 6. Candidate Prioritization. The last step in the process focuses on prioritizing candidates and identifying the source of funding to be pursued. In

this step, the list becomes a project office's priority for investing funds to improve the weapon system, and identifies high-priority improvements. Matching candidates to other sources of funds enables the project office to leverage its research, development, technology, and engineering funding to invest in other lower level priorities. The result is an investment strategy for modernizing components while reducing LCCs.

Conclusion

Reducing LCCs is not an easy task, but the process described above has proven that this objective is feasible. The process provides a methodical, disciplined approach to identify problems, screen items, identify all opportunities, and prioritize candidates into an investment plan.

Postscript

The PATRIOT Air and Missile Defense and the Multiple Launch Rocket System Program Offices are involved in developing in-house programs incorporating various aspects of the process for use in sustainment management. The IO Division is providing support to each office on different aspects of data collection and funding of potential projects.

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Introduction

Army experiments have indicated that there are distinct and measurable benefits to teaming manned aircraft and unmanned aerial vehicles (UAVs) to accomplish aviation missions. The U.S. Army Aviation Research, Development, and Engineering Center's Aviation Applied Technology Directorate (AATD) at Fort Eustis, VA, and the Air Maneuver Battle Lab (AMBL) at Fort Rucker, AL, have been working together to develop the manned-unmanned team concept. The intent of AATD's Airborne Manned-Unmanned System Technology (AMUST) Program is to find solutions to the technical challenges associated with teaming UAVs and helicopters. The AMBL is conducting a series of experiments to define and measure teaming benefits and establish manned-unmanned team tactics, techniques, and procedures.

Background

For several years, the Army has been developing the concept of teaming UAVs with aviation forces. In the early 1990s, AATD began work on a UAV teaming effort. A UAV program called the Autonomous Scout Rotorcraft Testbed (ASRT) was successfully demonstrated in 1996. The ASRT Program demonstrated the UAV's ability to take off, fly a route, detect and track a target, return home, and land under autonomous control. Recently, the Army and Department of Defense have renewed interest in teaming UAVs and manned systems and the AMUST Program was established to assist in this effort.

What Is AMUST?

The AMUST Program is directed at identifying and developing the technology to team UAVs and helicopters to increase combat effectiveness. The AMUST Program objective is to demonstrate through simulation and flight tests, the control mechanisms, intelligent linkages, and integration architectures to allow a manned-unmanned air vehicle system to operate a system of systems to increase the combined arms teams' battlefield effectiveness. Although our initial goal is to team helicopters and UAVs, we hope to apply this effort to the Army's family of ground vehicles and eventually to individual ground soldiers.

The AMUST Program is also looking at ways to capitalize on technology developed in other programs such as Comanche, Longbow Apache, Rotorcraft Pilot's Associate (RPA), ASRT, and Integrated Flight and Fire/Fuel Controls, and in commercial development efforts.

Technical Challenges

There are obviously many technical

TEAMING AIRBORNE MANNED AND UNMANNED SYSTEMS

**MAJ Allen L. Peterson
and Kristopher F. Kuck**

challenges associated with a complex program such as AMUST. Both industry and the Army have done significant early work to pair a single UAV with a single helicopter in the simulation environment. However, little or no actual flight demonstrations of any of these capabilities have been completed. Simulation efforts will continue as the program progresses, but live flight demonstrations will be conducted where appropriate. The AMUST Program Office is developing a detailed roadmap of how to get from where we are today to the fully integrated manned-unmanned team of tomorrow.

The AMBL-AMUST team is working closely with the other Services and academia to capitalize on their related development efforts. AMUST will also leverage efforts currently underway by the Defense Advanced Research Projects Agency, the Army, the Air Force, and the Navy to reduce the AMUST development risk. Some of these efforts include developments of cooperative maneuvers with manned platforms, tactical situation assessment, cooperative search area planning, and cooperative planning for multiple vehicles. Also, technology may be transferred from the Army's RPA Program to extend associate capability to the UAV to aid in the dynamic mission

management areas of communication, navigation, flightpath, and sensor control. Leveraging these efforts will reduce the development risk and cost of the AMUST effort.

As the number of UAVs on the battlefield increases, the likelihood of a collision with another manned or unmanned aircraft also increases. As such, we want to develop a collision avoidance system that has little or no impact on aircraft payload or signature and that leverages efforts currently underway by the Army, the Air Force, the Navy, and the Federal Aviation Administration. Addressing concerns about a collision with another manned or unmanned aircraft is necessary to expand acceptance of manned-unmanned teaming.

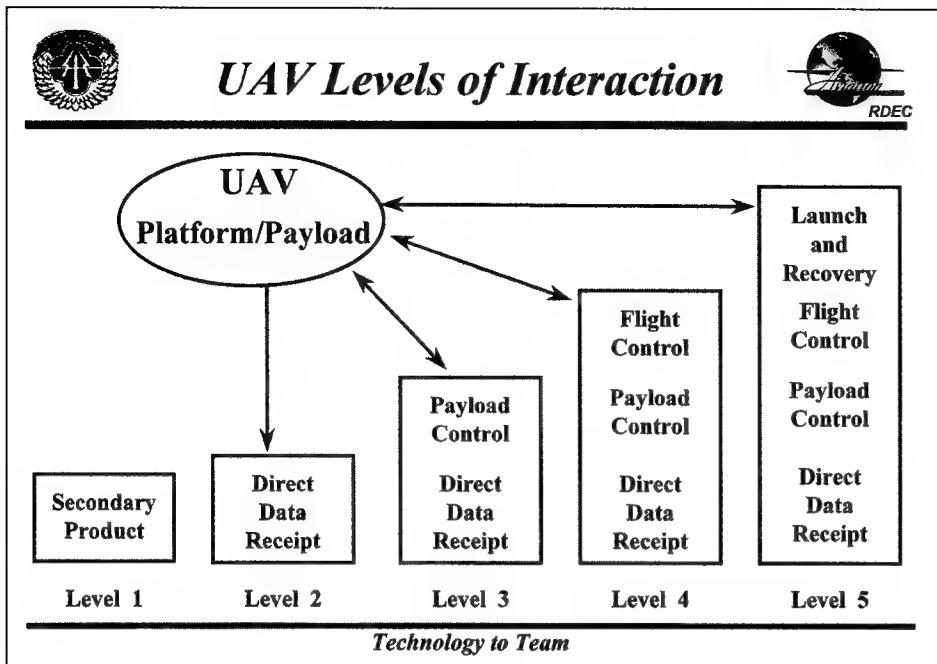
The AMUST effort is working with the U.S. Army Communications-Electronics Command and the Joint UAV Program Office in the area of sensor interface. We will leverage their sensor technology programs to attain a sensor package and sensor interface that is mission compatible with those aircraft that may be teamed with the UAV.

Operational Issues

If we determine that we can successfully team manned and unmanned aircraft, the question that remains is "What capability



UAV Levels of Interaction



does that system provide the commander or soldier in the field?" To answer this question, the AMBL designed a series of Manned-Unmanned (MUM) Concept Experimentation Programs to define and quantify the differences in mission performance between scenarios where helicopters and UAVs are employed as individual systems and scenarios where they are teamed as a system of systems.

MUM 1 established baseline interoperability data and examined employment alternatives critical to effective platform interfaces, operator performance, and networked performance (digital communications and critical command and control links) on the digital battlefield.

The results of the MUM 1 simulation indicated that there are distinct and significant tactical advantages in teaming manned and unmanned aerial platforms to conduct tactical reconnaissance. AMBL's report stated that manned-unmanned teaming is a more efficient use of assets and provides an increase in effective reporting, a reduction in mission completion time, and enhances survivability of the systems within the team. The experiment showed that manned-unmanned teaming reduced the time required to complete a tactical reconnaissance mission by more than 10 percent, increased the number of high payoff targets identified and reported by more than 20 percent, and improved the commander's ability to obtain more effective answers to critical information requirements by more than 30 percent. Finally, the experiment showed a decrease in the number of acquisitions and

trackings of the team by enemy systems.

MUM 1 established a foundation upon which to build the experimentation focus for the follow-on MUM 2 and MUM 3.

The MUM 2 experiment will involve a joint force conducting force projection and early entry operations. An aviation task force (brigade size), as part of a larger 21st century force, will employ aerial platform teams (manned and unmanned) to conduct missions supporting the commander's critical information requirements. A 21st century threat force will be equipped with armored systems, a robust air defense system, and a theater-level missile capability. The aviation task force will employ air maneuver reconnaissance teams (manned and unmanned platforms as a team) to maintain a continuous surveillance screen for force protection, and will conduct zone and area reconnaissance missions preparatory to deep strikes. An additional mission will be conducted to assess battle damage after target engagements by any delivery means (Air Force, cruise missiles, artillery, etc.).

A part of the matrix of the current MUM 2 testing is a determination of the effects on workload as we increase the level of interaction. There are currently five levels of interaction with the UAV as prescribed by the Joint UAV Program Office (see accompanying figure).

In the MUM 3 experiments and the AMUST effort, we will consider use of additional technology to improve efficiency such as automatic target detection and classification functions, other sensors, cognitive decisionmaking, and cooperative mission planning.

We are focusing the MUM and AMUST efforts on the effects of teaming the manned-unmanned system and the associated improvements in combat effectiveness. As a result of teaming during MUM 3, we expect a 35-percent improvement in operational effectiveness, a 25-percent improvement in operational efficiency, a 25-percent improvement in survivability, and a 50-percent improvement in timelines over a baseline nontequaled system.

Conclusion

The future of manned-unmanned teaming is limited only by the imagination of the people working on the programs and the funds available to pursue their ideas. Autonomous, cognitive, and possibly armed UAV team members are a distinct possibility in the not too distant future. Many interim steps are needed, however, to realize the benefits of manned-unmanned teaming sooner, and to develop a solid engineering base of teaming experience.

The opportunity to exploit the advantages of manned-unmanned teaming is at hand. With government and industry working together, we can provide the combat soldier with a manned-unmanned system of systems that will improve operational effectiveness, operational efficiency, and system survivability.

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U.S. ARMY ABERDEEN TEST CENTER ACCELERATED CORROSION TEST FACILITY

Steven King

Introduction

The U.S. Army Aberdeen Test Center (ATC) at Aberdeen Proving Ground, MD, recently constructed a unique facility that will enhance an already impressive durability testing infrastructure. The new addition is the Accelerated Corrosion Test Facility (ACTF). The idea for an ACTF developed as a result of the desire of materiel developers to thoroughly assess the durability of materiel by determining the susceptibility of systems and subsystems to corrosion, the presence of which can lead to premature failure, equipment

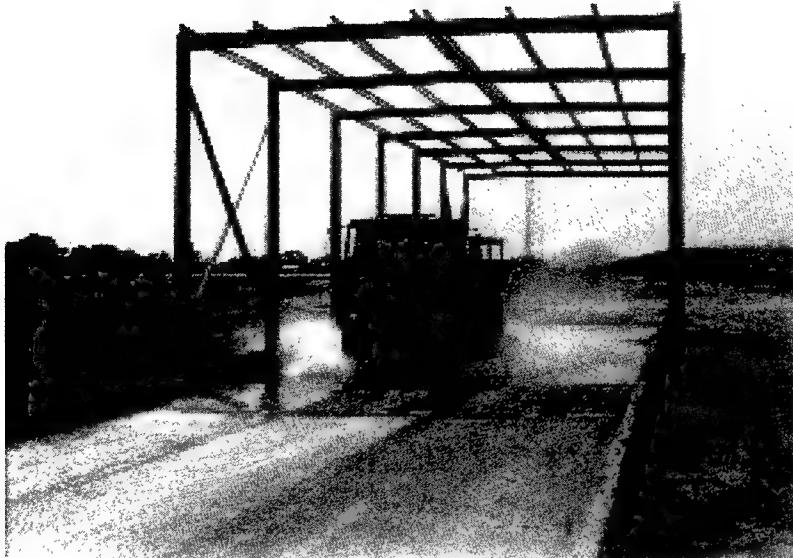
downtime, and expensive repairs. Inquiries from the Program Manager, Medium Tactical Vehicles (PM-MTV) and the National Guard Bureau regarding accelerated corrosion test (ACT) capabilities brought about the development effort. To expedite implementation of the ACTF, the PM-MTV provided a portion of the construction funding.

Purpose

A study conducted by the U.S. Army Tank-automotive and Armaments Command (TACOM) found that corrosion repairs cost the Army \$850

per truck each year, a significant cost considering the thousands of trucks currently fielded. As a result, TACOM was directed by the Army Materiel Command to develop a Corrosion Prevention and Control (CPC) Program to address the corrosion issue. The objectives of the program are to decrease life-cycle costs, increase Army readiness by reducing equipment downtime, and reduce the maintenance burden placed on diminishing Active and Reserve workforce resources. The ATC supports these goals by using the ACTF to evaluate CPC technologies identified

The testing capabilities of the Accelerated Corrosion Test Facility are used in conjunction with the various terrain profiles available at the Aberdeen Test Center to simulate the stress environment the system encounters in the field.



ACTF splash trough.

and implemented in developmental and fielded systems. The ACTF was developed with the technical assistance of TACOM, General Motors, and Ocean City Research Corp. The latter two organizations have vast experience in studying corrosion and performing ACTs.

Testing Capabilities

In an ACT, the vehicle undergoes an accelerated weathering process where it is exposed to the same corrosive environments expected to be encountered in the field. This typically involves applying corrosive (saline) solutions to the exterior of the vehicle using spray and splash methods, subjecting the vehicle to the stresses of field operations, and promoting the chemical reaction between the corrosives and materials using high humidity and temperature. While conducting a number of test track and environmental chamber exposure cycles, test personnel monitor and control vehicle corrosion rates based on mass loss of bare metal coupons placed at strategic locations on the system. The *actual* mass loss rates are compared to *target* mass loss rates, which are based on years of corrosion data obtained from vehicles operated in their true field environment. The corrosive applications, operating scenario, and exposure to high humidity and high temperature are

adjusted to ensure the mass loss rates properly track the target rates. Because target mass loss rates do not exist for most Army equipment, ACT programs are guided by target mass loss rates developed by the commercial industry for their vehicles and systems.

The ACTF features a mist booth where a corrosive solution is applied to the top and sides of the test vehicle. This solution has a chemical content and concentration indicative of the atmospheric fallout encountered in the field. Corrosives are applied to the undercarriage and underhood areas of the vehicle via drive-through splash and grit troughs. The splash trough (see accompanying photo) contains a saline solution of the proper makeup and concentration of deicing solutions typically found on roadways. The vehicle is driven or towed through this trough at highway speeds to generate the spray and splash patterns typical of those encountered on primary roadways.

The grit trough features a slurry generated from a combination of earth materials (sand, clay, limestone dust, cinders, etc.) and either water or a weak corrosive solution. This poultice represents the abrasives that are worked into the crevices and joints of the vehicle's body and chassis during both on- and off-road driving situations. The exposure to the abrasives provides a good indication of the durability of

CPC finishes applied to the vehicle.

The testing capabilities of the ACTF are used in conjunction with the various terrain profiles available at ATC to simulate the stress environment the system encounters in the field. The high humidity and temperature needed to accelerate the corrosive reaction is provided in an environmental conditioning chamber. The chamber is capable of simulating an atmosphere of 160 degrees Fahrenheit, up to 100-percent relative humidity, and 2-milliliter-per-hour water fog condensate. The ATC also provides the necessary laboratory facilities and equipment for identification, analysis, and documentation of corrosion that might occur on the test item.

An ACT can be tailored to match the mission profile of almost any ground system. The first ACT to be conducted at ATC involves two Family of Medium Tactical Vehicle 2.5-ton trucks. The two trucks will complete 330 corrosion and endurance cycles, representing 22 years of service life. Each cycle consists of approximately 70 miles of driving, including the corrosive applications, followed by overnight drying and high humidity and high temperature conditioning depending on the desired coupon mass loss rates. The trucks will incorporate a number of state-of-the-art CPC technologies for evaluation during this program.

Conclusion

As a natural extension of ATC's vast performance and endurance test infrastructure, the ACTF can be beneficial to a wide range of customers by helping them meet the objectives of the U.S. Army's corrosion control and prevention effort.

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DEVELOPING EFFECTIVE TEAMS

Steve Hammonds

Introduction

Proponents often tout integrated product teams (IPTs) as a panacea to solve the ills caused by the need to do more with less. However, successful IPT implementation is impossible without an adequate understanding of team philosophy. Teams are not new to the business world; yet, with a long history and numerous references as "the solution to the future of business," why are we still in the dark about effective teams? What are the essential factors that determine a real team? Why do some teams fail unmercifully and yet others surmount impossible obstacles to achieve notable success?

Why Pursue Teams?

The 1990s represent an era of increased pressure on all organizations, both industry and government, to generate high-level performance just to survive. Competition forces organizations to focus heavily on customer satisfaction, high-quality products, continuous improvement, and innovation. Maximized performance in each of these areas becomes harder for one person to administer. Top management increasingly turns to teams because they strengthen the performance capability of individuals, hierarchies, and management processes. They are practical, and they get results. With proper understanding and some team basics, team development achieves remarkable results.

Advocates must curtail internal resistance to teams as organizations shift away from traditional hierarchical organizational structures that

inherently promote individuality and search for new ways to improve performance. Managers often view teams as a waste of time spent in unproductive meetings. In addition, individuals often feel personal discomfort in a team setting, submitting their fate to the performance of others. Furthermore, weak organizational performance ethics promote resistance to teams and improper team development. A team hastily thrown together with no clear objective is destined to fail. Team failure reinforces management's slighted view of teams.

Characteristics Of Successful Teams

Teams that share certain characteristics tend to have greater success. These shared characteristics include a

Top management increasingly turns to teams because they strengthen the performance capability of individuals, hierarchies, and management processes.

significant performance challenge, strong performance ethics, individual performance recognition, and discipline within the team and across the organization. The clarity and consistency of an organization's overall performance standard (performance ethic) represents the single most important factor in generating effective teams. The following definition of a team, from *The Wisdom of Teams: Creating the High-Performance Organization* by Jon Katzenbach and Douglas Smith, is not just a definition, but a discipline followed by organizations seeking to enhance performance:

A team is a small number of people with complementary skills who are committed to a common purpose, performance goals, and approach for which they hold themselves mutually accountable.

This definition requires neither a leap-of-faith nor a retreat from intellectual reasoning to embrace. The definition implies that a small number of people can easily integrate while sharing complementary skills. Common purpose and specific performance goals set the tone, set boundaries, and create team identity. A commitment to a common approach focuses each team member on doing equivalent amounts of real work. Finally, the mutual accountability among team members establishes trust and commitment. The actual development of teams never follows an implementation guideline. Therefore, for an organization to harvest a real team,

it must first foster an environment based on a strong performance ethic. By establishing meaningful, strong performance standards, team members can focus on how the achievement of those goals will contribute to the organization's overall goals.

Team Performance Curve

The "team performance curve" (Figure 1) illustrates the development of teams from the initial foundation of a working group to a high-performing team. A *working group* relies on the individual performance of each member without focusing on a common purpose or goal. Any interaction among members usually takes place only to make decisions that will enable each member to perform better as an individual. If a common purpose, opportunity, or incremental performance goal exists, but is not focused upon, then a *pseudo-team* exists. This group represents the weakest of all five groups because the sum of the whole totals less than the individual potential.

When a group of people possess a common purpose, opportunity, or incremental goal, while constantly improving their performance, a *potential team* exists. Members increase their performance, but not collective accountability. A *real team* exists following achievement of collective accountability. Each member accepts mutual accountability for the approach taken by the group. The highest level group is a *high-performance team*. This team is committed to the success and growth of each member within it. If the team lacks a specific need, a member usually develops the skill necessary to overcome the deficiency. Work is not delegated to people outside the team.

Transformation From Individual To Team Performance

A team must take risks to move up the performance curve. Members must accept risks and understand the expectations of the team. A sense of urgency paired with clear and concise direction inevitably leads to the development of a real team. Available skills and potential skills, not personalities, comprise the criteria for selecting team members. If leaders draft likable individuals without analyzing

their skills, it is unlikely the team will succeed.

The first team meetings are critical to its success. Members must agree on a set of rules or conduct. For example, they may agree not to allow telephone calls during meetings, require that team information remain confidential, and agree that constructive criticism is necessary. Initially, setting immediate attainable goals or performance-oriented tasks allows the group to bond. Teams spend a lot of time together, especially during the early stages. Teams find a way to spend additional time together, particularly when things do not go as planned.

Team Leaders

Team leaders deal with obstacles not as barriers, but rather as a means to strengthen the team. A leader strikes a balance between action and patience, knowing when to stand aside and when to contribute. A team leader keeps the purposes, goals, and approach relevant and meaningful. By using positive reinforcement, he or she builds commitment and confidence at both the individual and team levels. The team leader removes all of the obstacles, both within the team and with outsiders. The leader gains respect and trust by taking on a large portion of

the responsibility, not by delegating nasty jobs to others on the team.

If a team encounters an insurmountable obstacle, it becomes grounded, which leads to discouragement among team members and could cause disbandment of the team. A team leader views this as an opportunity to confront the issue with a strong performance focus. Gaining a small win or retreating to team basics are possible approaches. In addition, the leader may seek an outside counsel, conduct training, expose the team to new information and different approaches, or possibly reconfigure the team. A high-performance team can usually deal with obstacles well enough to avoid being stuck; however, if this does occur, the momentum of the team can be lost. If the focus remains on team performance, the long-term benefits will outweigh the short-term, yet, unwarranted losses.

Teams And Performance

Significant performance challenges represent the most important factor in the success of teams. Empirical evidence suggests a perpetual relationship between an organization's performance ethic and the success of team formation. Organizations with strong performance ethics generally pursue challenges that

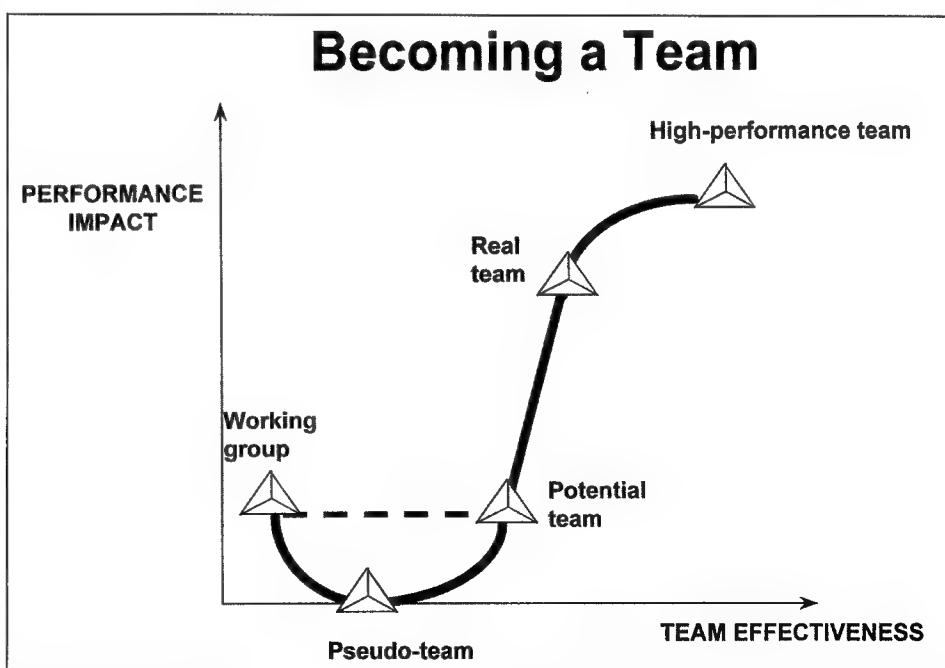


Figure 1.

All Stakeholders Benefit

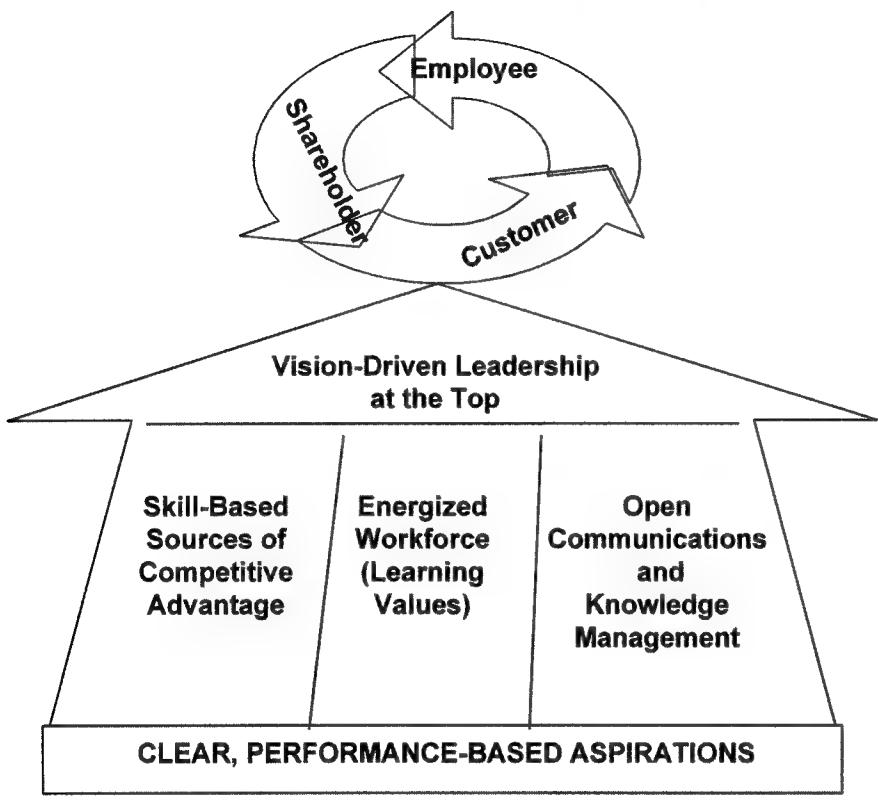


Figure 2.

are conducive to team creation. The created teams then yield superior results that serve to sustain the organization's general performance ethic. However, teams with weak performance ethics drastically reduce or eliminate significant performance opportunities. Challenges become lost in the noise as turf, politics, business-as-usual, and the "not-invented-here" syndrome take precedence. Lost opportunities, in turn, work to weaken performance ethics.

Traditionally, companies have focused exclusively on their stockholders, overlooking other stakeholders such as customers and employees. Performance ethic implies that organizations of all types seek benefits for customers, employees, and shareholders (Figure 2). The U.S. taxpayers are, of course, government organizations' shareholders. Performance challenges, associated with team formation,

promote employee morale. Employees gain pride being associated with an extremely performance-oriented organization, which translates into superior customer service.

Teams At The Top

Teams are tougher to form at the top; therefore, the critical issue is to determine when aspirations dictate levels of performance attained only by teams. The choice is between the working group and the team. The working group approach avoids the risk of failing at a quantum leap. Teams can lead to neglect of individual responsibilities because more time is required. In addition, a failed attempt at team formation at the top could breed team skepticism throughout the organization. The team approach, however, offers significant performance results over the working group.

A team is required if the collective

aspirations of the group are not attainable by the sum of individual performances. Even outside a team, dedicated managers can make considerable contributions. In considering team formation, the quality, capability, and attitude of each potential member is considered. A group of exceptional managers potentially achieves more as a working group. If skill deficiencies exist, teams often compensate for individual shortfalls and provide support for skill development. The leader of the organization must make a concerted effort to present a clear and compelling team option. In the absence of this effort, the automatic nature of the working group will likely allow it to persist.

Conclusion

Managers are increasingly turning to teams because they bolster the achievements of individuals and organizations. The performance of effective teams far exceeds the sum of each member's individual productivity. Teams are practical, and they get results. Ultimately, the success of a team depends on the total unyielding commitment of a small group of people. However, groups can only become effective teams if they define explicit, distinct, measurable goals. If your group lacks the conviction to become an effective team, seek out real teams and learn from them by observing them in action. Discover what works and why, then use this knowledge to begin creating your own effective team.

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REVIEWING THE ARMY'S MINE, COUNTERMINE, NONLETHAL WEAPONS, AND DEMINING PROGRAMS

Brian M. Green and
John M. Gallagher

Introduction

The Military Deputy to the Assistant Secretary of the Army for Research, Development and Acquisition (ASARDA) LTG Paul J. Kern has begun semiannual reviews of the Army's Mine, Countermeine, Non-Lethal Weapons (NLWs), and Humanitarian Demining (HD) Programs. Attendees at these reviews include the senior leadership from the Office of the ASARDA, other members of the Army's RD&A community, the Army Deputy Chief of Staff for Operations and Plans, representatives from the Training and Doctrine Command, the Marine Corps, and program managers and policy representatives for the subject areas.

Presented below is a synopsis of the first semiannual review.

Mines

The next generation of antiarmor munitions, the Wide Area Munition (WAM), is currently in low-rate production. The WAM uses acoustic sensors to detect heavy- and light-tracked vehicles, determines a firing solution, launches a payload that scans for an infrared signature, and fires an explosively formed penetrator. The WAM basic system will support early entry operations by light forces and will enter full-rate production in 1999. A product improvement will be redeployable and will have enhanced

(two-way) command and control capabilities.

Since 1996, the United States has been committed to aggressively pursuing an international agreement to ban the use, stockpiling, production, and transfer of antipersonnel landmines (APLs). On Sept. 17, 1997, the president announced that the United States would withdraw from the Ottawa Process because the treaty did not meet our national security concerns. Furthermore, the president outlined steps the United States would take on its own to help rid the world of landmines. One step directed the Department of Defense (DOD) to develop alternatives so that use of all "pure" APLs can be ended by 2003 (2006 in Korea). Of particular note, the president's APL policy retains the use of a "mixed" antitank/antipersonnel self-destruct system. As a result, the Army has initiated two new programs.

The first new program is called the Remote Area Denial Artillery Munition (RADAM). This initiative will retrofit the Remote Anti-Armor Munition (RAAM) projectile into a mixed munition system with RAAM and Area Denial Artillery Munition (ADAM) submunitions. This will be accomplished by downloading the ADAM and RAAM projectiles and uploading their submunitions into the existing RAAM projectile body. The hybrid projectile will be a single mixed artillery round for 155 mm howitzers. This effort was started in September 1997, but Congress had not approved the new work. On June 26, 1998, RADAM research, development, test and evaluation (RDT&E) funding was released and the program resumed. The RADAM RDT&E effort will specify the design and remanufacturing processes and the full-rate production effort that will convert the existing RAAM and ADAM inventory. The first RADAM projectiles will be fielded by the third quarter of FY01.

The second new program is a two-track Anti-Personnel Landmine Alternative (APLA) acquisition. The Secretary of the Army was directed to develop alternatives for APLs, particularly in Korea, while the long-term effort (2010 and beyond) was tasked to the Defense Advanced Research Projects Agency. The Army's program is the Non-Self Destruct Alternative (NSD-A). The Army solicited technical papers from industry and then paid 12 contractors to submit full proposals for the NSD-A. All the proposals were required to offer methods to prevent target activation of lethal alternatives. Verification by the

operator of a hostile intrusion into the minefield must be accomplished before a lethal fire command can be initiated. Award of NSD-A contracts is on hold until FY99 funding is received.

Countermine

The Army's experience in Somalia and Bosnia revealed a landmine threat that has grown more durable, more available, and more difficult to detect. Countering this threat remains a significant technical challenge, but sustaining the technical effort has been hampered by the cyclical nature of the interest in countermine research and development.

The current countermine capability includes the battalion countermine sets for the M1 tank, which include the tracked-width mine blades, tracked-width mine rollers, and the improved dogbone assembly (rolling anti-magnetic mine actuating device). These items were fielded and effective during the Gulf War. The Army's current breaching capability is the Mine Clearing Line Charge. Other fielded systems include the AN/PSS-12 Hand Held Metal Detector and the Launched Grapnel Hook. Countermine contingency items include the Mine Rake for the Combat Engineer Vehicle and the recently procured Interim Vehicle Mounted Mine Detection System (IVMMD). The IVMMD adds a significant improvement in capability over the current means used for route clearance. The IVMMD provides ballistic and mine blast-protected platforms to detect and mark metal-cased antitank mines and proof the route. The IVMMD can detect mines at 12 to 15 kilometers per hour, a 30-fold increase over the current capability. The lead detection vehicle will be teleoperated as part of a planned product improvement.

Relative to countermine research and development, the Stand-Off Minefield Detection System Programs provide leap-ahead technology in mine detection. The Hand Held Stand-Off Mine Detection System has the ability to detect low-metal content and nonmetallic APIs. The Ground Stand-Off Minefield Detection System constitutes the Vehicle-Mounted Mine Detection Program. This system will detect low-metal content and nonmetallic antitank mines with lower false-alarm rates and improved confidence. Both are multisensor systems and will incorporate automatic target recognition. The Army also will have improved clearance and breaching

capabilities provided by the M1-based Grizzly obstacle breaching vehicle. Some countermine efforts still do not have approved requirements or funding. These include minefield and breached lane marking, magnetic mine countermeasures, and on-route neutralization.

NonLethal Weapons

The Army has the lead for 11 product lines of NLWs and these programs are managed by the Close Combat Armaments Center at the U.S. Army Tank-automotive and Armaments Command's Armament Research, Development and Engineering Center. These programs leverage weapon systems already in the inventory. The end result will be nonlethal means of incapacitating individuals, breaking up formations of hostile personnel, and less than lethal protection of area security missions. The NLW effort will provide enabling technologies for the non-self destruct APLA mentioned earlier.

Some of the NLWs on the horizon are as follows:

- The Non-Lethal Crowd Dispersing Round, which includes an M203 grenade launcher with a payload of 24 rubber balls for crowd control.
- The Modular Crowd Control Munition, which uses Claymore mine dispensers to disperse stinging rubber balls over an area.
- The Bounding Non-Lethal Munition, which uses the bounding API approach to deliver malodorous substances, riot control agents, and entanglement nets.

A contingency stock of NLWs has now been established to support Operations Restore Democracy (Haiti) and Joint Endeavor (Bosnia). The stock includes 40 mm rubber ball munitions and 40 mm foam baton munitions, 12-gauge flash/bang munitions, and 12-gauge beanbags. The future concept for fielding NLWs will employ a "company set" of weapons that are palletized, rapidly deployable, and stockpiled forward within a theater of operations.

Humanitarian Demining Technology Development Program

Congress initiated this DOD program in 1995 to respond to the worldwide concern over the proliferation of landmines. The HD Program concentrates on mine detection and neutralization technologies that can be shared internationally. The HD Program is complimentary to the Army's countermine program and invests in

technology areas that are low tech and easily transferable to foreign nations with unskilled labor. Major areas of emphasis of the program are detection of landmines, clearance and neutralization, individual demining tools, and mine awareness and training. The Army is the lead Service for the research and development effort.

The HD Program has resulted in deployment of several materiel systems for field evaluation in various countries. These include miniature mine detectors, a miniature mine flail, the Berm Processing Assembly, and a supersonic air spade. The HD Program has also resulted in development of the Demining Support System that enables countries to train their personnel in all facets of demining operations. Mine awareness comic books have been produced in several languages to aid countries in educating their citizens on the dangers of landmines.

Conclusion

These programs differ in their requirements, infrastructures and methods of execution. They are being conducted in a politically charged environment that requires versatile planning and management, and compliance with national policy. These programs are intended to help reverse the proliferation of landmines, to detect all mines in all environments, and to employ less than lethal capabilities on the battlefield; yet, they must ensure the safety and security of our soldiers who are deployed throughout the world.

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THE VALUE OF OUTSOURCING

J. Michael Brower

Introduction

Proponents of outsourcing are legion, but simple explanations of how outsourcing makes money are rare. Never questioned in detail, articles about outsourcing and its handmaiden, privatization, abound in the print media and on the Internet but rarely do we read what brings so much executive patronage to these stylish management paradigms. In reality, outsourcing and privatization are merely old wines in new bottles, and their proponents usually succeed in inebriating their target audiences before they've explained exactly how savings are derived.

Fundamentally, outsourcing is the pursuit of lower labor costs at a break-even quality level. Specialization is the key. The presumption is that workers focusing on a particular productive activity will have been led by enlightened management to discover the economic efficiencies that can deliver a service or product cheaper than in-housers while sustaining an acceptable level of quality. With privatization, an entire function once performed by local, state, or federal

government is turned over to the private sector. Generally, *responsibility* remains with the host entity—the outsourcer or the company receiving the privatized tasks administers and manages the project. Outsourcing and privatization also share a common source for the lion's share of the bottom lines they deliver: reduction of the labor costs that are often among the highest of business expenses. The potential of reducing those costs compels many a CEO toward endorsement of the outsourcing option.

The New Face Of Outsourcing IT

Information technology (IT) has offered many outsourcing lessons in recent years. Nominally, outsourcing occurs when a company's management realizes an external expertise is more economically and practicably contracted out than grown. Take the recent decision by pharmaceutical maker Eli Lilly and Co. to outsource its online health care network to IT giant Electronic Data Systems (EDS). Eli Lilly will shed unwanted payroll by effectively

putting workers into the company receiving the outsourced project. Eli Lilly staff looking for employment with EDS will be "offered jobs at EDS based on skills," according to an EDS spokeswoman. It's a short-term, stock-enhancing win-win for both companies. EDS gets a labor pool hungry for work, Eli Lilly reduces its costly rolls. The workers do their share by keeping wages flat, and flat wages have dominated the U.S. labor scene for years.

Another of outsourcing's feeding fields is technically minded immigrant labor. These workers, particularly from China and India, frequently possess very high technical competence. Their entry into the information management world is curing the decidophobia gripping indigenous workers who might have held out for better working arrangements. Now that Congress is being told by information systems (IS) giants like Intel and Microsoft that foreign worker quotas must be increased to ensure a flow of new program and network administrators, unionless American computer specialists will be more amenable to bargaining. The *Wall Street Journal* recently discussed how high-tech companies have asked for an exception to immigrant quota levels to permit more foreign techies into the country. According to Intel's president, Craig Barrett, if federal limits on technical immigrant personnel remain at current levels, "the talent will go where the opportunities are, even if that is offshore." Indeed, *Business Week's* Chief Economist, William Wolman, similarly concluded along with co-author Anne Colamosca in their book *The Judas Economy* that when capital learns it can outsource for computer programmers and code writers in Beijing and New Delhi at one-third the wage of similarly skilled U.S. workers, stockholders will, albeit unwittingly, demand that capital fly to Beijing and New Delhi.

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When it comes to outsourcing, charity certainly doesn't start at home. Roy Beck, editor of *The Social Contract* magazine, found that instead of training its own cadre of technologists, Microsoft prefers to "import tens of thousands of foreign programmers" or ship work overseas because wages are lower. He quotes the 1990 census that found foreign-born workers in Silicon Valley worked for nearly "\$7,000 less than did natives of the same age and level of education." Taking the lead from computer and software makers, universities are in the push to keep wages low, Beck found. "The universities have kept their Ph.D. numbers up by increasingly turning to foreign students. So the universities crank out far more scientists than are needed for industry, the U.S. government, and for university professorships. The glut works further to the universities' advantages because there is a large pool of scientists willing to continue to work for low wages in postdoctoral research positions for another 3 to 6 years. The universities, therefore, gain an even larger low-paid workforce." This is the real value of IT/IS outsourcing: a slashed labor cost.

Yesterday's News— Tomorrow's Lessons

By driving down employee costs through reducing or discontinuing benefits and maximizing employee mobility, employers create super competition among workers in a global marketplace. Examples of this can be seen in recent books like Jeremy Rifkin's, *The End of Work* (1995), and William Greider's, *One World Ready or Not: The Mantic Logic of Global Capitalism* (1997). Rifkin concluded that work as we know it may disappear at a rapid pace in the West as unfettered post-Cold War capital migrates to that part of the global village sporting the lowest cost laborers. Greider makes roughly the same prediction with hundreds of globetrotting examples of shifting fortunes for the world's typical worker. With the "communist menace" moldering on the ash heap of history, capital has grown adventurous.

Incidents of outsourcing's ravages are everywhere in the news. The machinist strike at McDonnell Douglas in June 1996 was largely over the question of outsourcing to nonunion subcontractors. Similarly, Operation Joint Endeavor in Bosnia offered a windfall to

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costs (e.g., training, relocations, in-house bonuses) are nonissues with the use of an exogamous workforce.

Conclusion

And now to outsourcing's paradox. How are American employees with their flat wages supposed to purchase the goods and services they produce, thanks to the labor efficiencies wrought by outsourcing, with pay that isn't commensurate with the purchase of those self-same goods and services? The answer is that they can't—and overproduction and underconsumption are the results. This is, for instance, a primary cause of the recent "Asian Currency Crisis." The native population cannot afford to buy the goods and services they've created because they were underpaid during the creation process (the difference is profit). Asian capital must rely on the West's credit culture to soak up surpluses that will be offered at very attractive prices.

Sadly, U.S. credit card debt is at an all-time high, along with personal bankruptcies, so relief for fiscally strapped Asian economies through more U.S. private debt may not be realistic. Unfettered outsourcing has contributed to this financial conundrum of employee inability to afford what he or she creates. When the vogue of outsourcing fades away, its legacy will be one of short-term profit and long-term economic instability, all at the expense of the average workers who are its principal source of value.

contractor Brown and Root, according to John Roos, Editor of *Armed Forces Journal International*. Labor savings were realized through the Logistics Civil Augmentation Program by employing a contractor labor force at \$100 million compared to the \$318 million it would have cost to have soldiers do the work. Support for the government employees—retirements, solid benefits, free chow, and so forth—were expenses the contractor did not have to endure. The lesson learned is this: While other ways of reducing costs exist (e.g., velocity management, process reengineering, single stock funds, use of technology), none are as readily demonstrable or as quickly registered as payroll reductions.

The telling point is that outsourcing's economic incentive begins with the idea that wages, benefits and other employee

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CONTINGENCY CONTRACTING IN KOREA: A CIVILIAN'S PERSPECTIVE

Introduction

The contracting community in Korea is composed primarily of civilian Acquisition Workforce employees. In the event of a contingency on the peninsula, many of these employees must remain to support U.S. and allied forces.

When I first arrived in Korea nearly 4 years ago, I learned immediately what the designation "emergency essential" could mean. Soon after my arrival, the news of Kim, Il-Sung's death, and the probability of succession by his son, Kim, Jung-Il, caused heightened anxiety in an already tense land. The idea that I was living in a country still officially at war began to sink in as we were trained to survive under hostile conditions. We were taught how to don mission oriented protective posture (MOPP) gear and timed while putting on our protective clothing and clearing our gas masks. "Don your mask in 9 seconds, or you are dead."

I began to reflect on the importance of our mission during a contingency. Logistics support does not happen overnight and, as the basic necessities of life become scarce, it takes time for the military machine to function. We, in contracting, buy time. The problems we will face appear insurmountable. If war breaks out, martial law will be declared, and the vendors with whom we do business will most likely head south. Because our main office is located in Seoul and is within range of North Korean artillery, we will have to learn to deal with chaos.

Military personnel are trained to function under such situations. Civilians, for the most part, are not. If we are able to perform our mission successfully under hostile conditions, we need to be trained, at least to some degree, to be soldiers.

William Mills

Preparation

The most important part of dealing with crises is preparation. Our first concern is to think through the problems associated with our business during a contingency and to find solutions.

Most contractors will be unavailable during hostilities. If war breaks out in Korea, nearly every able-bodied Korean man will be conscripted into the South Korean military. All businesses, including all modes of transportation and use of the roads, will fall under military rule. The South Korean government recognizes that during hostilities, U.S. Forces will need to retain some of the services being performed by Korean contractors. Our first step is to identify those contracts that must continue and ask the South Korean government to grant exemptions for conscription.

Next, we must address the issue of safely beginning to write new contracts. Troops will be arriving at different locations throughout the peninsula and we must respond quickly to their needs. This requires going from a centralized contracting concept to a more localized one. To achieve this, the main contracting office personnel will disperse to remote field locations throughout the peninsula to set up main operating locations and subordinate operating locations.

A command must be able to recall its personnel and transport them to their new areas of assignment. The personnel must then be able to set up field operations in these new locations using "contingency kits" that contain

everything needed to start contracting.

The way business will be conducted during hostilities will further complicate matters. For instance, vendors will want cash upfront. A team that includes the contracting officer, pay agent and an individual from the requiring activity will go into the field to buy and accept the necessary goods or services.

During a contingency, the methods of contracting will be different, the place of doing business will be foreign, and the overall conditions will be threatening. The only way to perform successfully in such an environment is to have some experience. In other words, civilians must be trained to react to the conditions of war.

Training

The first thing a civilian must be taught is how to survive. In Korea, every emergency essential person is issued MOPP gear and trained in its use. Civilians also go through first aid training, Geneva Convention training, and other training that soldiers receive. The recall roster is exercised periodically with personnel reporting to the staging area where they are transported to their various wartime operating locations.

Personnel also receive training on the methods of contracting during a contingency. By April 1998, every emergency essential Contracting Command Korea employee completed the Defense Acquisition University course (CON 234) on contingency contracting. Contracting personnel routinely assist in the various exercises played out on the peninsula so they have some idea of the various requirements generated during hostilities. However, this is not sufficient to teach people how to contend with the *fog of war*.

As part of a major exercise in March 1997, the Contracting Command Korea deployed personnel to locations throughout the peninsula where they opened a headquarters, a major operating location, and a subordinate operating location. These personnel were charged with supporting requirements of incoming forces and going through contingency exercise scenarios. As part of the exercise, military contracting officers arrived from the United States and were placed under the command of local personnel.

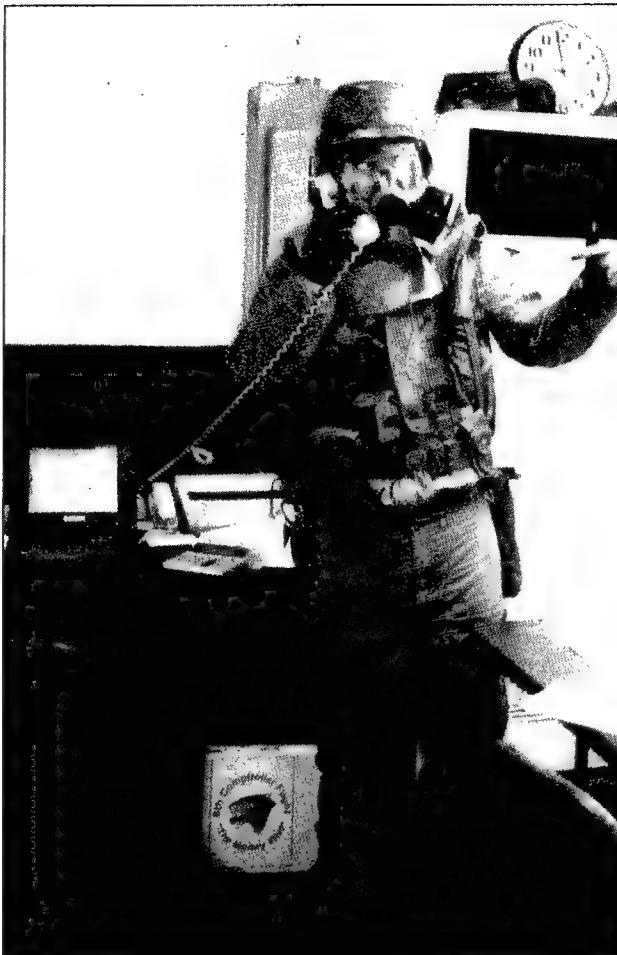
During the next 6 days, in between hiding under my desk and sucking air through my gas mask, I dealt with the death or desertion of personnel, inoperable communication lines, power outages, enemy infiltration, changing requirements, and a desperate lack of vendors. Merely getting to and from work was difficult. At one point, I was nearly taken prisoner by our own troops because I did not know the proper identification hand signals. Although these difficulties helped me to understand the confusion of war, much of the actual job of contracting still had to be simulated. We did not go into the field with a pay agent and a suitcase full of cash for purchases.

My final immersion into contingency contracting came during a 1-month stint as Contracting Officer in Lao. Formerly known as Laos, the Lao Peoples' Democratic Republic was formed when the country gained independence from French rule after the 1975 revolution. Though not under war conditions, the economy of the country and the various political pressures of doing business in Lao demanded that we operate using contingency contracting procedures.

In The Field

Even some 20 years after the end of the Vietnam War, the problem of unexploded ordnance remains a dangerous and economically crippling situation for Lao. As part of the humanitarian effort in Lao, the U.S. Special Forces established a school to teach the people of Lao how to detect unexploded ordnance and render it safe. The U.S. Demining Contracting Office supports this effort.

During wartime, and in undeveloped countries where financial institutions are in their infancy, suppliers demand cash for their goods and services. To perform his or her mission, the contracting officer works with a pay agent who comes into the country with a predetermined amount of money (in



Ever tried conducting business over the phone wearing a gas mask?

Lao it was \$200,000 each quarter). The majority of purchases are made in cash at the local market.

Contracts are also written for services that are required on a recurring basis. These range from laundry services, cooks and interpreters at the Demining School, to the rental of school property. Payment for these services is usually made in cash on a monthly basis.

The contracting office in Lao is located within the American Embassy in the capital city of Vientiane. This adds to the complexity of the operation. The office location and the operation's humanitarian nature infer that the office does not function within a military vacuum but, rather, is tangled within the political vines of the State Department.

Conclusion

During a contingency on the Korean peninsula, a large portion of the goods and services required to sustain the influx of troops must be contracted from our host nation. This critical support requires that civilian contracting personnel on the ground be trained, equipped, and mentally prepared to work under arduous conditions. The mission is real and

Contracting Command Korea is treating it as such.

The command recognizes that civilians make up an important part of the machinery of war in Korea and that they must be trained to function effectively under hostile conditions. The civilians have responded enthusiastically to these opportunities. If the need ever arises, and we all hope such an occasion never occurs, Contracting Command Korea will have acquisition professionals ready to do the job.

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What Impact Will The Y2K Problem Have On Your Operations?

Dr. John W. Lyons
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The millennium computer problem, or as it is frequently called, the Y2K bug, presents a variety of challenges for the Army Research Lab (ARL). Being a high-tech research lab, ARL uses computers and computer software in a variety of ways. ARL and its predecessor organizations have a long history in computers—from building the first computer (ENIAC), to creating some of the earliest computer graphics programs, to hosting one of only 13 Internet root domain name servers in the world.

As we began looking at the Y2K implications at ARL, it became obvious that there were a broad range of problems, concerns, and potential impacts ranging from none, to minor inconveniences, to the potential shutdown of major systems. As we examined ARL-developed systems, we found software written as far back as the early 1970s that accounted for year 2000 dates and understood that the year 2000 is a leap year. (Every 4 years is a leap year unless the year is evenly divisible by 100. This is the rule that most people know; however, the rule goes further. If the year is evenly divisible by 400, then it is a leap year. Thus, the year 2000 is a leap year. Many systems do not have the 400 rule built in and do not treat the year 2000 correctly.) By the same token, we found software (mostly commercial off-the-shelf) that would break on Jan. 1, 2000.

ARL has prioritized its Y2K remediation efforts to ensure that systems affecting life safety or the warfighter are addressed first. Next on the list are systems impacting a large number of personnel, such as payroll systems. This prioritization effort extends to desktop personal computers and peripherals.

ARL has learned several lessons during this process. First, Y2K impacts can occur in areas typically not considered. Research programs thought not to have any Y2K problems might have some. Even worse, vendors uncover problems that were not previously considered, so devices that we thought were Y2K compliant suddenly are not. Thus, the first lesson



learned is that one must constantly recheck vendors' statements looking for changes in the status of equipment. Use of the World Wide Web is critical in staying informed of the Y2K status of commercial products.

Second, we accept that every possible Y2K bug is not going to be found. Contingency plans are being put into place to address potential problems. For example, a piece of our contingency planning is to ensure we have staff on duty Jan. 1, 2000, to deal with any problems.

Third, no one is in this alone. Sharing information and lessons learned is beneficial to us all. We have benefited by the Y2K work with vendors done by the U.S. Army Communications-Electronics Command as well as work done by other organizations. The various Y2K-related sites on the World Wide Web provide a source of information and ideas for addressing various Y2K issues.

Fourth, if you don't have a good baseline inventory, you don't know where you stand. ARL developed a Lotus Notes inventory tool that allows us to collect data on all our systems and then manipulate the data in a variety of ways, not only to respond to various data calls, but more importantly, to allow ARL senior management to see the status of our compliance efforts along a variety of dimensions. However, the database is not just for Y2K points of contact and senior management; everyone at ARL will have access to the information. Thus, if an ARL scientist wants to know if anyone has a particular machine or software package that is needed, the database will provide a source of information to answer the question.

The fifth and most painful lesson learned by ARL is that it is still difficult to get people to take the Y2K problem seriously. Many people still view the data collection and remediation as "busy work" keeping them from working on their mission. Changing this viewpoint is a management challenge that is being met by involving ARL executives, providing clear and sensible instructions, and minimizing the collection of needless information so people will not view this as a mindless exercise.

In summary, ARL is attacking the Y2K problem with a variety of tools and skills. Our most important tool is using our knowledge of systems to ensure that our most important ones are fixed and that any problems we have Jan. 1, 2000, are only inconveniences and not threats to our mission.

SPEAKING OUT

MG Robert L. Nabors Commanding General U.S. Army Communications-Electronics Command

Resolving the Y2K problem is this command's number one near-term priority. This is a significant leadership and management challenge for the U.S. Army Communications-Electronics Command (CECOM) because many of the Army's most critical systems rely on our computers, processors and software to carry out a broad array of Army operations.



Most importantly, CECOM and Team C4I(EWS) (Command, Control, Communications, Computers, Intelligence, Electronic Warfare and Sensors) provide the software support and hardware for a significant portion of Army weapon systems. These include more than 300 strategic and tactical systems currently used by the warfighter in the field. We are making them Y2K compliant.

CECOM also supports core Army business systems such as the Commodity Command Standard System, the Standard Depot System, and the Army Communications Security Commodity Logistics Accounting Information Management System. These systems comprise close to 25 million lines of code and CECOM is ensuring they are Y2K compliant.

Additionally, CECOM supports the Headquarters, U.S. Army Materiel Command (AMC) Y2K project by providing technical assistance and staff support to AMC's initiative to make its entire business-computing infrastructure Y2K compliant. This includes upgrade of processors, networks, and peripherals in AMC's 12 major subordinate commands and 8 reporting activities.

Though I consider myself to be the command's Y2K Project Manager, I have chartered a CECOM Y2K System Manager to ensure the success of this aggressive campaign. His job is to provide oversight of all CECOM initiatives and to serve as the principal interface with the Department of the Army, AMC, Program Executive Offices and CECOM activities worldwide to ensure integration of Y2K efforts involving the systems managed by CECOM.

Overall, no insurmountable problems are anticipated as CECOM works diligently to ensure our systems will operate in the new millennium.

Michelle Generaux Mesa Y2K Site Manager The Boeing Company Mesa, AZ



If I were exceedingly optimistic (better yet, if I had a crystal ball), I would have to respond that there will be no impact. All affected software, hardware and firmware would have been identified, assessed, remedied, documented, and tested. On Jan. 4, 1999, I mean 2000, employees returning from their holiday break would pass through the electronic badge scanner without thought, take the elevator to their well lit and appropriately temperate cubicles, and successfully log on to the network to begin their day. Business as usual. Seamless.

However, not being the owner of a crystal ball and being somewhat realistic, Jan. 4 probably won't go that smoothly. The nagging fears are "What's been forgotten?", "Have we missed any crucial interfaces?", "What if we do everything right and a second or third tier

supplier falters?", and, "What if a supplier never even considered that Y2K might affect his small business?" Right now, there are more questions than answers. Steps being taken to obtain answers include soliciting suppliers' responses as to the Y2K readiness of their products; researching web sites (try <http://www.vendor2000.com>) that list vendor products and their Y2K readiness by part, model or version number; and requesting suppliers to inform us if their business systems are also Y2K ready.

Our Y2K focus has been on the continued ability to meet production demands, to maintain delivery schedules, and to ensure a safe and healthy working environment for every employee. For these reasons, Boeing has been converting and doing extensive testing on critical systems with a schedule to be completed no later than midyear 1999. Throughout 1999, we will be working on contingency plans, which may include requesting early delivery of production supplies and lots of candles and pencils (I'm joking about the last two items). We plan to have programmer-staffed "SWAT" teams available to rapidly respond to Y2K problems. There will be hot lines set up and a process in place to determine priority of response. Here at Boeing Mesa, our goal is to be up and running and fully functional on Jan. 1 for those employees who must work during the holiday break. Just in case, though, it never hurts to be prepared.

Kin Chan Chief, Technical Management Division Office of the Program Manager Joint Computer-Aided Acquisition And Logistic Support



The Joint Computer-Aided Acquisition and Logistic Support (JCALS) system consists of the infrastructure and the applications it supports. The application currently being developed is the Joint Technical Manuals (JTM) for the Army, Air Force, Navy and Marine Corps. Integrated data environment applications that are either operational or experimental pilot programs are in the field for each of the Services. The JCALS Office received approval to field the infrastructure in May 1995, and JTM Milestone III approval was granted for the Army, Navy and Marine Corps in August 1998. The current JCALS baseline is Software Package 2 (SWP2). Our Y2K certification effort is based on the phased approach in the Army Y2K Management Plan. As I write this, we plan to achieve certification for SWP2 and field a Y2K-compliant product by Dec. 31, 1998.

We discovered various commercial off-the-shelf (COTS) software products and some code that contained Y2K problems. These Y2K problems, if not fixed, could have affected our ability to archive, operate databases, process transactions, manage networks, requisition, publish, compile, budget, and interface. However, these problems are fixed, and government validation testing is underway. The fixes involved a combination of COTS replacements or upgrades, code modifications and workarounds. If additional problems are discovered during the validation phase, the plan is to fix them within the Army Y2K schedule. Agreements have been established with interfacing systems that define how date-related interaction with JCALS will be conducted. The impact to the users will be minimal. Today, there are no known adverse effects on system operations because of Y2K fixes. Currently, we have not encountered any impact as a result of Y2K horizon effects from those applications that are in full operation in the field. Government testers will certify future JCALS software packages and infrastructure upgrades as Y2K compliant before release to the field.

CAREER DEVELOPMENT UPDATE

From The Director Acquisition Career Management Office

Happy New Year! It's hard to believe we are in calendar year 1999. The Acquisition Career Management Office (ACMO) has already established the 1999 Army Acquisition Workforce (AAW)/Army Acquisition Corps (AAC) Roadshow schedule. Attendance at the roadshow is just one means of providing you information from your region. You can also consult the Acquisition Workforce Support Specialist assigned to your region, or your regional Acquisition Career Management Advocate. Their phone numbers and e-mail addresses are available on the AAC home page at <http://dacom.sarda.army.mil>, along with similar information on Functional Acquisition Specialists, U.S. Total Army Personnel Command points of contact, and proponency officers and other ACMO contacts. The AAC home page also contains information on publications, policies, professional opportunities, and other information crucial to acquisition career management.

The ACMO hosted the annual Acquisition Career Management Workshop in December 1998, providing an opportunity for the invaluable exchange of ideas among a broad range of acquisition professionals. Key workshop discussions focused on acquisition issues in the United Kingdom, leadership qualities and experiences of U.S. Army acquisition professionals, and opportunities for operational experience. Be sure to read the article on the workshop in the next issue of *Army RD&A*.

Don't miss the information on applying for Senior Service College selection, or the information on the upcoming lieutenant colonel promotion boards in this issue.

We have a number of career management issues to focus on in 1999. Be your own acquisition career manager and stay informed about the programs available to you. Take that knowledge one step further and share the information with a co-worker! I am highly encouraged by our visits to the field, which show an increasingly informed workforce. We will certainly do our part to ensure you receive information you need, and hope that you will continue to listen and provide us input on the AAC's programs and initiatives.

COL Edward Cerutti
Director
Acquisition Career
Management Office

AAC Display Debuts At The Annual AUSA Meeting

The Army Acquisition Corps (AAC) display, titled "We're With You!" was proudly debuted at the annual meeting of the Association of the United States Army (AUSA) in October 1998. The display includes photographs of acquisition professionals, soldiers, and the systems they work on. The photos depict the Army Acquisition Workforce (AAW) working with the soldier to provide the best systems for our troops. A 15-month, 10th Anniversary Calendar—featuring the photographs in the AAC display—was provided to attendees. The highlight of the display is an AAC/AAW music video. Be sure to see the display when it comes to your region! Check the roadshow schedule on the AAC home page for more information. To receive a calendar, please e-mail requests to wellsb@sarda.army.mil. It will be sent to you as long as supplies last!

Roadshow Update

The Army Acquisition Workforce (AAW)/Army Acquisition Corps (AAC) Roadshow continued in November 1998 with a stop in Edgewood, MD. Keith Charles, Deputy Director for Acquisition Career Management, briefed AAW members from Edgewood Arsenal and Aberdeen Proving Ground. A briefing for supervisors followed. The Mobile Acquisition Career Management Office team remained onsite to provide assistance to AAW members. The next roadshow is scheduled for the National Capitol Region in January 1999. Check the AAC home page for details!

PERSCOM Notes . . .

1999 Senior Service College Officer Selection Board

A Department of the Army selection board will convene April 6, 1999, to consider eligible officers in the Army competitive category for academic year 2000-2001 resident senior service colleges (SSC) and fellowships, SSC foreign schools, and academic year 2000-2002 Army War College Corresponding Studies Course (AWCCSC).

Officers who meet the following criteria are eligible for selection to a resident SSC or for a fellowship, an SSC foreign school, or the AWCCSC:

- Must not have completed more than 23 years (276 months) of active federal commissioned service (AFCS); must have completed a minimum of 16 years (192 months) AFCS as of Oct. 1, 2000; and must be a colonel or lieutenant colonel as of the board convene date.
- Promotable majors must be promoted to lieutenant colonel by the board convene date.
- Must have credit for completing a command and staff level college (military education level 4).

CAREER DEVELOPMENT UPDATE

- Must not have attended, received credit for attending, or declined a resident SSC, SSC fellowship, or an equivalent foreign school.
- Officers enrolled in, graduated from, or disenrolled from AWCCSC class 99-01 or later are no longer eligible for consideration.
- Officers with an approved separation date (either from resignation or retirement) are not eligible for SSC consideration.
- Officers exceeding AFCS eligibility criteria may request additional eligibility by submitting a written request with adequate justification to the Acquisition Management Branch (AMB), U.S. Total Army Personnel Command (PERSCOM). The request does not require command endorsements. An example of adequate justification may include (but is not limited to) the fact that previous SSC boards did not consider the officer's entire lieutenant colonel command (or equivalent) file. Requests of this nature should be received by PERSCOM by March 1, 1999.
- The PERSCOM Evaluations Reports Branch must receive all evaluation reports (complete-the-record, required, or optional), error free, by April 8, 1999, for the report to be considered by the SSC Selection Board. The required "thru" date for complete-the-record reports will be Feb. 7, 1999 (note the 180-day minimum time requirement).

In January 1999, PERSCOM will send out preboard packets to the home address of officers being considered by the SSC Board. These packets will include a board officer record brief, microfiche, and a checklist. Eligible officers should carefully review their files using the checklist provided and resolve problems early. Officers who meet the consideration criteria above and do not receive a preboard packet should contact their assignment officer immediately. For more information, contact the following lieutenant colonel assignment officers in the AMB at PERSCOM. For functional areas (FAs) 53 and 97, contact MAJ Dwayne Green, (703) 325-3124, DSN 221-3124, or e-mail: Greend0@hoffman.army.mil. For FA51, contact MAJ Paul Myrick, (703) 325-3129, DSN 221-3129, or e-mail: Myrickp@hoffman.army.mil.

FY99 Lieutenant Colonel Promotion Selection Board

The FY99 Lieutenant Colonel Promotion Board will convene in March 1999. The official dates of the board will be announced in the coming months in a Department of the Army (DA) message. Information on the promotion board dates can also be found on the Internet at the following web address: <http://www.perscom.army.mil/select/tntzone.htm>. Both promotion eligibility and zone of consideration are based on your date of rank to major as follows:

Above Zone: July 1, 1994 and earlier

Primary Zone: July 2, 1994 through May 1, 1995

Below Zone: May 2, 1995 through March 1, 1996

The list below details some things you can do to prepare yourself for this significant event in your career:

- Complete Combined General Staff College by correspondence if you are not already a graduate.
- Verify all entries on your Officer Record Brief (ORB). Duty titles with unusual acronyms are a problem on ORBs. Turn them into plain, understandable language. Ensure that your awards information is current. If there are any discrepancies, send a copy of your award certificate only (including award orders number and social security number) directly to your assignment officer.
- Contact your local Personnel Service Center (PSC) or Military Personnel Office (MILPO) to update your e-mail address, home address and duty and home phone numbers. This information is not part of the ORB, but it must be up to date in the U.S. Total Army Personnel Command's (PERSCOM) personnel network. The assignment officers at PERSCOM need a way to contact you if there are any problems or questions regarding your file. If the PSC or MILPO are unable to make these changes, contact the appropriate assignment officer listed below.
- Update your photo. New photos are required every 5 years; however, a new digital or computerized color image is strongly recommended. Be sure your basic branch (not Acquisition Corps) is shown on the photo. Send the photo to your assignment officer in the Acquisition Management Branch (AMB). Do not allow the photographer to send in your photo. The mailing address for AMB is as follows: U.S. Total Army Personnel Command, ATTN: TAPC-OPB-E, 200 Stovall St., Alexandria, VA 22332-0411.
- Review your microfiche and tell us if anything is missing. Officer Evaluation Reports (OERs) and Academic Evaluation Reports should account for all your time in military service. Meritorious Service Medals and higher awards are critical. Ensure all qualification badges (ranger, airborne, etc.) are documented. Procedures for requesting a copy of your microfiche can be accessed at: <http://www.perscom.army.mil/opmd/ord/fiche.htm>.

• Submit your closeout and/or annual OER on time. The DA message announcing the Lieutenant Colonel Promotion Board will specify the "thru" date for closeout OERs. Many senior raters hold OERs until the last minute, and some past OERs have arrived dangerously close to the cutoff date. Assignment officers are not part of OER processing procedures. Your PSC or MILPO sends OERs directly to the OER Branch at PERSCOM.

If you have any questions, contact the following assignment officers: Functional Area (FA) 51, MAJ John Masterson, (703) 325-3128, DSN 221-3128, e-mail: mastersj@hoffman.army.mil; FAs 53 and 97, MAJ James Norris, (703) 325-5479, DSN 221-5479, e-mail: norrisj@hoffman.army.mil.

From The Acquisition Reform Office...

PLS Alpha Contracting Success Story

The Project Manager's Office for Heavy Tactical Vehicles used the alpha contracting process for the award of the Palletized Load System (PLS) Engineering Mission Module Program. The alpha contracting process covers the concurrent development of the statement of work and the contractor's proposal to meet those requirements with evaluation and negotiation in an integrated product team (IPT) environment. The IPT establishes minimum requirements and then concurrently develops, evaluates, and negotiates the proposal.

The PLS truck is an on/off road truck designed primarily to transport, load, and unload ammunition for the U.S. Army. Its capability is unique in that only one operator is required to load, transport, and unload 33,000 pounds of ammunition without leaving the truck cab. This is accomplished by having cargo loaded onto flatracks, which the truck can self-load and unload through the hydraulically powered load handling system.

The key benefits of using the alpha contracting process were a 50-percent reduction in acquisition cycle time (from 6 months to 3 months); a 50-percent reduction in proposal preparation costs; a 20-percent reduction in hardware costs; a reduced administrative burden; an improved partnership with contractors and subcontractors; and maximum use of current commercial technology.

For additional information, contact Steve Draper at DSN 786-5439 or (810) 574-5439.

IMPAC Card Makes Procuring Supplies Faster And Cheaper

The Directorate of Contracting (DOC), Fort Knox, KY, recently solicited bids for 1,800 items using Part 12 (Procedures for Commercial Items) of the Federal Acquisition Regulations (FAR). The DOC made multiple 1-year awards using firm fixed-price Indefinite Delivery/Indefinite Quantity (ID/IQ) contracts to purchase supply items. In all, 16 awards were made to 13 small businesses and 3 large businesses. The small business awards represented approximately 96 percent of the total estimated contract dollar value.

Under FAR Part 12, the ordering and payment process permits use of the government purchase card and is consistent with the Army's "paperless contracting" initiatives. Order processing time was 1 day compared to an average of 3 days under the old process. Through the first 2 weeks of the contract period, 245 of the 275 line items ordered were received within 72 hours.

Overall, Fort Knox customers are procuring supplies faster and cheaper. The Fort Knox Directorate of Logistics (DOL) inventory levels have been significantly reduced and/or eliminated. In addition, contractors are paid faster, interest payments under the Prompt Payment Act have been eliminated, and invoice payments through the Defense Finance Accounting System are reduced to one transaction a month to reimburse the IMPAC Card Services for vendor pay.

The Fort Knox DOC is the first contracting activity in the U.S. Army Training and Doctrine Command (TRADOC) to implement this new acquisition reform initiative to procure the DOL and the Directorate of Public Works recurring supply items. This was a joint effort by the HQ TRADOC Directorates for Acquisition and Logistics and the Fort Knox DOC and DOL. TRADOC selected the Fort Knox DOC and DOL for the test based on their experience and success in the award and administration of ID/IQ contracts using the government purchase card in lieu of hard-copy delivery orders. TRADOC officials anticipate this process will be implemented commandwide.

For additional information, contact Richard Goodin at DSN 464-7152 or (502) 624-7152.

CONFERENCES

53rd Machinery Failure Prevention Conference

The U.S. Army Research Laboratory, the Office of Naval Research, and the National Aeronautics and Space Administration are sponsoring the 53rd Meeting of the Society for Machinery Failure Prevention Technology (MFPT) at the Ramada Plaza Resort, Oceanfront, in Virginia Beach, VA, April 19-22, 1999. The conference theme, "Failure Analysis: A Foundation for Diagnostics and Prognostics Development," was chosen to highlight the need for a link between failure analysis results and improved reliability through development of new methodologies in predictive and proactive maintenance. Theme papers are requested, but abstracts that provide knowledge about the prevention of machinery or structural failure are acceptable. For more information, contact Henry or Sallie Pusey at MFPT Headquarters, 4193 Sudley Road, Haymarket, VA 20169, by phone at (703) 754-2234, by fax at (703) 754-9743, or by e-mail at hcpusey@ix.netcom.com, or on the MFPT home page at <http://www.mfpt.org>.

Project Management: Strategic Design and Implementation, 3rd Edition

By David I. Cleland, McGraw-Hill, 1998.

Reviewed by LTC Kenneth H. Rose (USA, Ret.), a Project Manager with the Waste Policy Institute in San Antonio, TX, and a former member of the Army Acquisition Corps.

It is always a welcome event when an old teammate puts on a new uniform and re-enters the stadium with new vigor and new ideas. Such is the case with David I. Cleland's third edition of *Project Management: Strategic Design and Implementation*. This edition is an updated version of a long-honored text that is used extensively in university courses and Fortune 500 corporate training programs.

The book is well suited for academic and corporate use. Its improved structure makes it an ideal tool and guide for self-study as well. Each chapter ends with three common elements: a summary, a list of discussion questions, and a user checklist. Each summary includes a "bullet" list of key points in the chapter, which serve a two-way function. Readers may view the list after completing the chapter to codify their understanding, or they may scan the list before reading to select or prioritize chapters for study. In this new edition, references are made to two related books for further illumination: *A Field Guide to Project Management* (reviewed in *Army RD&A*, May-June 1998) and *Project Management Casebook* (reviewed in *Army RD&A*, July-August 1998).

Discussion questions stimulate thought and discourse on the theory presented in each chapter. The user checklist addresses application of theory in a practical environment, often introducing questions with the phrase, "Does your organization ... ?" Both sections aid the reader in bringing to life that which otherwise might exist only as a cold concept.

The book's 21 chapters are divided into seven parts. Part 1 introduces the evolution and foundations of project management, describing why it is something of universal interest "whose time has come." It also concisely discusses the major functions and life-cycle options of project management.

Part 2, The Strategic Context of Projects, describes when to use projects within an organization, emphasizing that projects are a medium for change and the building blocks in the design and execution of organizational strategy. A solid, informative discussion of stakeholder management includes a model linked to the basic functions of project management. Discussion includes the novel suggestion that in some cases, stakeholders constitute a "virtual organization" that can have significant influence on project execution. The section closes with a discussion of strategic issues, citing studies that show planning, project definition, and stakeholder management—not technical issues—are the primary determinants of project success.

Part 3 addresses organization design. It starts with the premise that projects are founded on temporary organizations: varied, fluid, and constantly changing. It establishes the matrix as the organization design of choice, and defines a spectrum of five types based on the sharing of control between project and functional managers. It also defines the work package as the intersection of project and functional interests, and the real focus of any project effort. Chapter 9 describes the linear responsibility chart as a superior means for displaying and understanding individual and collective roles within the organization. This key information is not disclosed by a traditional organization chart, which focuses on a general framework of organization elements. Chapter 10 advises readers that understanding roles and authorities is essential because most failures in matrix organizations arise from incompleteness in this area of management.

Part 4, Project Operations, deals with planning, project management information systems, control, and termination. It discusses planning models and scheduling tools, including the work breakdown structure. One sentence in Chapter 12 almost screams its relevance to those who prepare a project review. "All too often projects are characterized by too many data and not enough relevant information on where the project stands relative to its schedule, cost, and technical performance objectives as well as the project's strategic fit in the parent organization's strategies." The chapter goes on to prescribe principles for effective project management information systems. Chapter 13 discusses project control and includes several lists of questions as a framework. The book does not provide the answers; they are found in actual project performance. Chapter 14 follows with discussion of reasons and strategies for project termination.

Part 5 addresses leadership, communications, and team interactions. A useful table presents traits exhibited by good and poor project leaders, as described by a collection of experienced, senior project managers from major corporations. Attitude, vision, and interpersonal skills are central themes throughout. The chapter on communications highlights good listening skills and sensitivity to nonverbal cues as essential. It also discusses effective meeting techniques and opportunities that arise from teleconferencing and groupware technology advancements. Chapter 17, Working With Project Teams, describes team building as "one of the most critical leadership qualities" in today's project environment. It provides a simple model for analyzing team performance and walks the reader through each element.

Part 6 addresses the importance of organization culture in project success, and Part 7 provides insights for the future, focusing on alternative teams and general trends.

In the densely populated field of project management literature, *Project Management: Strategic Design and Implementation* stands as a central resource. Its intrinsic links to other resources provide a degree of value that is not available in any similar text. It would be well chosen as a basic element for any project management professional's personal bookshelf.

Hope Is Not A Method: What Business Leaders Can Learn From America's Army

By Gordon R. Sullivan and Michael V. Harper,
Broadway Books, New York,
paperback edition, 1998.

Reviewed by LTC John Lesko (U.S. Army Reserve), a Senior Analyst and Group Facilitator with ANSER and a member of the Army Acquisition Corps. He is a frequent contributor to Army RD&A.

When *Hope Is Not A Method* was first published in 1996, it became a national bestseller. Its authors rode the prolonged wave of success that the nation's victories in Operation Desert Storm, Provide Comfort, and Haiti permitted. Former Chief of Staff of the Army (CSA) GEN Gordon Sullivan and his co-author, former CSA Staff Group Director COL Michael Harper, boldly offered business management advice to industry. They suggested a blueprint for corporate change. The book's subtitle stated here was "What Business Leaders Can Learn from America's Army."

Today's Army executives no longer benefit from "the halo effect" of recent victory. Senior Army leaders are not given automatic or unquestioned credit for managerial competence, economic insight, or business acumen. This is not a value judgment, political commentary, or a nostalgic call to return to the early 1990s. It's just the way it is.

During congressional hearings in 1998, each of the Service chiefs had the unpleasant duty to comment on and explain why the military has suffered a slip in readiness (perceived or otherwise). Warnings of "another hollow Army" rang through this most recent round of questioning and subsequent expert testimony. Serious discussions of the challenges that face today's smaller force—strained by an increase in operational tempo—have been the principal topics of debate.

For a short while, stories in the nation's major newspapers echoed these sober, troubling concerns. What a difference a few years, a few months, or even a few weeks can make in the news or book publishing business.

That was then. Times have changed and copies of *Hope Is Not A Method* are now more difficult to find. However, members of the Army Acquisition Corps should take the time and make an effort to find this book. Then, they should read, study, and discuss this work with their colleagues.

Chapters 1 through 6 help the reader understand why our Army needed—and still needs—to change, how to leverage productive change, how to "see with vision," and how to create a strategic architecture for the Army's continued evolution from where it is today, through Force XXI, to the Army After Next. These early chapters set the stage for those that follow.

Chapters 7 through 13 offer relevant and specific guidance to acquisition leaders who must build a team, transform an organization, move beyond initial or early program success, and then "grow" a learning organization to sustain a system through the fielding and deployment stages of an acquisition life cycle. These later chapters address "thin threads" or experimentation, the critically important "after action review," and "the sine curve," concepts that occur in all organizations. Readers should spend time in these later chapters if only to better understand how the battle laboratories and advanced technology demonstrations are meant to drive organizational change.

In the book's epilogue, the authors admit that their writings may have "short changed" those in the acquisition community. "New and changed processes have made the Army a true power projection force that is capable of going anywhere in the world to do, it seems, almost anything. ... The real reengineering story is not in the fighting part of the Army so much as in the sustaining base, the more bureaucratic and industrial part of the Army. It is in the Army Materiel Command, the Medical Command, the Training and Doctrine Command, and the other major commands that we find the unsung heroes of the Army's transformation."

Sadly, today's more titillating headlines have grabbed the nation's psyche. Copies of *The Starr Report* have "muscled out" older titles from the retail shelves. Prices for military books on management and leadership seem to have fallen sharply.

The paperback version of *Hope Is Not a Method* can now be found on discount tables at some of the larger bookstores. The serious acquisition professional should not be fooled into thinking that this particular text has lost its utility. This reviewer suggests that with recent reductions in the price, this book may now be, ironically, both a "low cost" and a "best value" addition to one's professional library.

NEWS BRIEFS

Y2K Infrastructure Test Successful

Initial results indicate the Year 2000 (Y2K) Infrastructure Test at White Sands Missile Range (WSMR) in New Mexico conducted late last year was a success.

For the test, computers used in routine base operations and communications were advanced through seven dates. For example, the missile range's telephone switch, essentially a computer, was rolled through the dates as voice and data transmissions were occurring through the switch. During the first Y2K rollover, audience members were encouraged to use the phones in the briefing room and participate in the test. Members of the news media were also allowed to make calls during the test so they could experience firsthand what was happening.

In addition to the telephone switch, computers controlling police and fire alarms were advanced to ensure they would work when the new millennium arrives. Children from the White Sands Middle School were also on hand doing research on the Internet as dates were advanced.

In another area on the post, the missile range's automatic water pumping system was tested. The computer was advanced to see if it could still detect the water level in the storage tanks to activate pumps when the level is low. All tests were successful.

Thus far, WSMR has tested, patched, upgraded, and certified 6,500 individual computers. In addition, more than 18,000 computer software components are scheduled for Y2K compliance. Taking into account computer and software remediation materials, labor, some new equipment, and the certification tests, WSMR has invested about \$3 million in Y2K solutions.

NEWS BRIEFS

Agreement Targets Digital Aerial Camera Procedures

The U.S. Army Topographic Engineering Center (TEC), the U.S. Geological Survey (USGS), and EarthData Technologies Ltd. (EDT) have signed a 1-year Cooperative Research and Development Agreement to establish certified calibration procedures and techniques for digital aerial cameras. The unified efforts of TEC, USGS, and EDT will further promote development and refinement of digital cameras and increase their use by government and civilian organizations in military and civilian mapping applications.

PERSONNEL

Andrews Takes Over As Deputy Assistant Secretary For Research And Technology

Dr. A. Michael Andrews II has been appointed as Deputy Assistant Secretary of the Army for Research and Technology/Chief Scientist, Office of the Assistant Secretary of the Army for Research, Development and Acquisition (OASARDA).

With more than 25 years of leadership experience in technology development, business management, and strategic planning, Andrews was appointed in 1997 to the senior executive service (SES) as Director for Technology, OASARDA. Prior to his SES appointment, he was employed by Rockwell International. Positions at Rockwell included assignments as Director, Defense Technology Applications (Systems Development Center); Director, Research and Engineering (Corporate); Director, Electro-Optical (E-O) Center; Division Chief Engineer, E-O Systems; and Assistant Director, Electro-Optics (Science Center).

Andrews has a Ph.D. in electrical engineering from the University of Illinois, and M.S. and B.S. degrees in electrical engineering from the University of Oklahoma.

He was named Rockwell Engineer of the Year in 1979. Additionally, Andrews has five patents and has published 49 articles.

Costello Takes Over As SMDC Commanding General

LTG John Costello, former Commanding General, U.S. Army Air Defense Artillery Center and Fort Bliss, TX, has succeeded LTG Edward Anderson III as Commanding General, U.S. Army Space and Missile Defense Command.

With more than 28 years of active military service, Costello has served tours as Director, Roles and Missions, Office of

the Deputy Chief of Staff for Operations and Plans, Department of the Army, Washington, DC; Assistant Division Commander - Maneuver, 1st Armored Division, U.S. Army Europe and Seventh Army, Germany; Commanding General, 32d Army Air Defense Command, U.S. Army Europe and Seventh Army Germany; and Commander, 35th Air Defense Artillery Brigade, I Corps, Fort Lewis, WA.

He holds a bachelor's degree in political science from The Citadel, a master's degree in foreign affairs from the University of Virginia, and a master's degree in military arts and sciences from the U.S. Army Command and General Staff College. In addition, he has completed the Air Defense Officers' Basic and Advanced Courses, the Armor Officer Advanced Course, and is a graduate of the U.S. Army War College.

Listed among his military honors are the Distinguished Service Medal, the Legion of Merit (with two Oak Leaf Clusters (OLCs)), the Bronze Star Medal, the Meritorious Service Medal (with three OLCs), the Army Commendation Medal (with OLC), the Army Achievement Medal, the Senior Parachutist Badge, and the Ranger Tab.

LETTERS

Dear Sir,

I would like to see articles on maintenance concepts for the future. Such articles could include automatic test systems, test program sets, and the Army Diagnostic Improvement Program. What are the maintenance concepts, who, where, and how? Articles on support equipment for our Army would also be interesting and welcome.

Curtis Snider
Redstone Arsenal, AL

ARMY RD&A WRITER'S GUIDELINES

About Army RD&A

Army RD&A is a bimonthly professional development magazine published by the Office of the Assistant Secretary of the Army (Research, Development and Acquisition). The address for the Editorial Office is: DEPARTMENT OF THE ARMY, ARMY RD&A, 9900 BELVOIR RD, SUITE 101, FT BELVOIR VA 22060-5567. Phone numbers and e-mail addresses for the editorial staff are as follows:

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Purpose

To instruct members of the RD&A community relative to RD&A processes, procedures, techniques and management philosophy and to disseminate other information pertinent to the professional development of the Army Acquisition Workforce.

Subject Matter

Subjects may include, but are not restricted to, professional development of the Army's Acquisition Workforce, RD&A program accomplishments, technology developments, policy guidance, information technology, and acquisition reform initiatives. Articles containing footnotes are not acceptable. Acronyms used in manuscripts and with photos must be kept to a minimum and must be defined on first reference.

Length of Articles

Articles should be approximately 1,500 to 1,600 words in length. This equates to approximately 8 double-spaced typed pages, using a 20-line page. Do not submit articles in a layout format.

Photos and Illustrations

A maximum of 3 photos or illustrations, or a combination of both, may accompany each article. Photos may be black and white or color. **Illustrations must be black and white, in PowerPoint, and must not contain any shading, screens or tints.** Not all photos and/or illustrations may be used and they will not be returned unless requested.

Biographical Sketch

Include a short biographical sketch of the author/s. This should include the author's educational background and current position.

Clearance

All articles must be cleared by the author's security/OPSEC office and public affairs office prior to submission. The cover letter accompanying the article must state that these clearances have been obtained and that the article has command approval for open publication.

Offices and individuals submitting articles that report Army cost savings must be prepared to quickly provide detailed documentation upon request that (1) verifies the cost savings; and (2) shows where the savings were reinvested. Organizations should be prepared to defend these monies in the event higher headquarters have a higher priority use for these savings. All Army RD&A articles are cleared through SARD-ZAC. SARD-ZAC will clear all articles reporting cost savings through SARD-RI. Questions regarding this guideline can be directed to SARD-ZAC, Acquisition Career Management Office, (703)604-7103, DSN 664-7103.

Submission Dates

Issue	Author's Deadline
January-February	15 October
March-April	15 December
May-June	15 February
July-August	15 April
September-October	15 June
November-December	15 August

Submission Procedures

Article manuscripts (in MS Word) and illustrations (in PowerPoint) may be submitted via e-mail to bleicheh@aaesa.belvoir.army.mil, or on a 3 1/2-inch floppy disk via U.S. mail to DEPARTMENT OF THE ARMY, ARMY RD&A, 9900 BELVOIR RD, SUITE 101, FT BELVOIR VA 22060-5567. Photos may be e-mailed for review purposes only, but glossy prints must be sent via the U.S. mail. All submissions must include the author's mailing address, office phone number (DSN and commercial), and a typed, self-adhesive return address label.

1998 INDEX OF ARTICLES

This index is a headline listing of major articles published in *Army RD&A* during 1998.

JANUARY-FEBRUARY

- Interview With LTG Paul J. Kern, MILDEP to the ASA (RDA) And Director Of The AAC, Page 2
- Prime Vendor Support: Wave Of The Future, Page 5
- Updating DSMC Courses With Acquisition Reform Initiatives, Page 7
- Acquisition Reform Reinvention Lab, Page 10
- New Initiatives, New Challenges For The Army's Acquisition Workforce, Page 13
- The Raytheon Experience: Training With Industry, Page 16
- Acquisition Information Management Service, Page 18
- Joint Technical Architecture—Army Compliance, Page 21
- Army Acquisition Career Management Workshop Addresses Current Initiatives, Key Challenges, Page 23
- Rebuilding The Economic Base During Operations Joint Endeavor And Joint Guard, Page 27
- Applying Modeling And Simulation To The Grizzly Program, Page 30
- Video In The Ambulance: Future Battlefield Technology Today, Page 34
- The Time Has Come For Geographic Information Systems, Page 38
- Combat Identification For The Dismounted Soldier: An Acquisition Reform Success, Page 40

MARCH-APRIL

- Army Science And Technology: Investing For The Future, Page 2
- Army Science And Technology Accomplishments, Page 4
- DCMC Team Streamlines Bradley Contracting, Page 14
- DCMC Army Commanders, Page 17
- The Force XXI Division AWE, Page 20
- An Update On Modernization Through Spares, Page 22
- From Industry: Leadership In The Age Of Acquisition Reform, Page 26
- Assessment Of AMC's Acquisition Reform Efforts, Page 28
- The Central Technical Support Facility, Page 30
- Five Skills Every Acquisition Professional Should Master, Page 34
- Pitching Procurement In The Newly Independent States, Page 36
- The Foreign Comparative Testing Program, Page 38
- Acquisition Of Chemical And Biological Equipment, Page 40
- What Are Those Little Molecules Up To Now?, Page 44

MAY-JUNE

- The Army After Next, Page 2
- Collaborative Testing And Evaluation, Page 6
- Life Cycle Cost Drivers From The PM's Perspective, Page 10
- A New Approach To The Army Manufacturing Technology Program, Page 13
- Army Recognizes 53 Engineers And Scientists With R&D Achievement Awards, Page 16
- Reducing The Army's Battery Usage And Costs, Page 19
- Army Acquisition Corps Officer Management XXI, Page 22
- Outstanding Achievements In Materiel Acquisition, Page 26
- Modeling And Simulation In Support Of Test And Evaluation, Page 29
- ARL, University Of Delaware Collaborate On New Composite Armor Process, Page 31
- Pacific Contingency Contracting Officers Working Group, Page 33
- ATC Helps Maryland State Police Crack Down On Aggressive Drivers, Page 35
- The Vehicle Control Unit For The HMMWV, Page 36
- Army Logistics Goes On-Line, Page 38

JULY-AUGUST

- A Heavy Division For The 21st Century, Page 2
- Simulation-Based Acquisition: A Good Thing, But How Do We Get There?, Page 4
- U.S. Army Simulation-Based Acquisition Symposium, Page 6
- The Virtual Environment, Page 8
- Joint Vaccine Acquisition Program, Page 11
- Hunter Sensor Suite, Page 14
- Update On The Corps Eligible And Competitive Development Group Programs, Page 18
- 1998 Competitive Development Group Orientation, Page 23
- Officer Personnel Management System For The 21st Century And The AAC Officer, Page 26

- Increasing Project/Product Manager And Acquisition Command Opportunities, Page 28
- Central Management Structure Of The AAW, Page 30
- The Acquisition Workforce Certification Process, Page 32
- Civilian Attendance At The U.S. Army War College, Page 36
- The Acquisition Education And Training Program At The Army Command And General Staff College, Page 38
- Training With Industry For Civilians, Page 40
- Beyond The Classroom: The Future For Acquisition Education and Training, Page 43
- Proposed DOD Civilian Acquisition Workforce Personnel Demonstration Project, Page 48
- DOD, OPM Host Public Hearing On Acquisition Workforce Personnel Demo, Page 49
- Acquisition Position Management, Page 51
- Civilian, Military, Reserve, National Guard, and Medical Department Acquisition Position Lists, Page 53

SEPTEMBER-OCTOBER

- Interview With LTG William H. Campbell, DISC4, Page 2
- First Digitized Division Implementation, Page 5
- Army Battle Command System, Page 8
- Implementing Force XXI, Page 11
- Joint Tactical Radio System Program, Page 14
- Army Enterprise XXI, Page 18
- Taking Digitization To Our Allies, Page 21
- Simulation-Based Acquisition: Real World Examples, Page 25
- Digitized Cooperation With Canada, Page 27
- The Army Materiel Release Process, Page 30
- On-The-Job Sustainment Training For Military Foreign Language Skills, Page 32
- Microelectromechanical Systems: An Emerging Technology, Page 34
- Perceptions Of An I-GRAD Program Participant, Page 37
- Stimulating Software Reuse Through Improved Acquisition Processes, Page 39
- Battlefield Awareness And Data Dissemination, Page 41
- Rapid Acquisition At The Army Space Program Office, Page 44
- TARDEC's Simulation-Based Vehicle Acquisition And Support Capabilities, Page 46
- Ground Vehicle Mobility Technology: Electromechanical Suspension, Page 49
- Using Miniature-Scale High-Explosion Experiments To Study Weapon Effects, Page 51

NOVEMBER-DECEMBER

- Interview With GEN Dennis J. Reimer, Chief Of Staff Of The Army, Page 2
- AMC's Logistics Reform Efforts, Page 7
- Contractors On The Battlefield, Page 10
- Supporting Training Systems Through Fixed Price Contracts, Page 12
- Contingency Contracting In Support Of Operation Joint Guard, Page 15
- The Power Of Videoconferencing, Page 17
- Simulation And Modeling For Acquisition, Requirements And Training And Cost As An Independent Variable, Page 19
- ASARDA Recognizes Outstanding R&D Organizations, Page 22
- 21st Army Science Conference Features Best Technical Papers, R&D Achievement Awards, Page 24
- Using R&D Technology Programs For Affordability, Page 27
- Unmanned Aerial Vehicles Demonstrated Where They're Tested, Page 30
- 'Super User' IMPAC Cards For Contingency Contracting Officers, Page 32
- Department Of Energy Oak Ridge Complex, Page 34
- Cockpit Display System, Page 37
- A Coat Of Paint Does More Than Look Good, Page 39
- Integration Of The Army National Guard And Army Reserve Into The AAC, Page 41
- Reengineering Field Maintenance Troubleshooting Procedures, Page 43
- Fire Support For The Army After Next: Will The Early Entry Forces Have Enough?, Page 45
- Army Acquisition Workshop Honors PMs And Acquisition Commanders Of The Year, Page 47
- Army Researchers Develop Fibrin Bandage, Page 49